Electrical Contracting

THE MAGAZINE OF ELECTRICAL CONSTRUCTION



INDUSTRIAL ELECTRIFICATION SECTION
PAGES 133 to 144

This new Ford aviation engine plant brings new ideas in electric construction. See page 7. Here's how light speeds production.

OCTOBER, 1941

In this issue an Editorial Feature Section shows what to use for Modern Lighting.



SPUN-ALUMINUM FLOODLIGHTS

G-E spun-aluminum floodlights are available for lamp sizes from 300 to 1500 watts and beam angles from 28 to 100 degrees. They have a one-piece die-cast socket housing, and door glass to protect the reflector interior against penetration of rain, fog, or smoke. Other features include a waterproof, rubber-packed entrance bushing and a variety of mounting attachments.



FORM 104 LUMINAIRE

The newly introduced Form 104 luminaire for property-line lighting is available for either 300- or 500-watt multiple lamps and equivalent size series lamps. The rust-protected, sheet-steel body has two toggle latches for attachment to any of the internal- and external-type Form 79 hoods. A chromium-plated copper reflector back of the lamp directs the light through the heat-resisting Fresnel lens to form a narrow-vertical and broad-horizontal light distribution pattern.



FORM 79-VR LUMINAIRE

This luminaire has the long narrow distribution pattern that is admirably suited for property-line lighting. In addition to the one-piece hood, spun-sealed glassware, and dustproof joint, which are common to all 79's, the VR unit has a G-E Holophane refractor globe that "lifts" the downward light and projects it almost parallel to the ground. Usual installation is within the property line and spaced five to seven times the mounting height.



TYPE S-5 SEARCHLIGHT

This 1000/1500-watt, 18-inch incandescent searchlight has a silvered-glass reflector and a spherical auxiliary reflector in front of the lamp to eliminate stray light and build up beam intensity. Pilothouse control allows the beam to be projected in a full 360-degree horizontal and 90-degree vertical sweep. Usual installation is on top of a guard tower along the fence line or on the corner of a building to supplement yard lighting when there is the slightest suspicion of trouble.

SATISFY YOUR CUSTOMERS
WIDEN YOUR MARKET
SAVE YOUR TIME

USE G-E FLOODLIGHTS FOR PROTECTIVE LIGHTING

HAVE you noticed the large number of protective lighting jobs using G-E equipment? There must be reasons.

One reason is our complete line of floodlighting equipment. With a choice of more than 20 units, you can fill any need for protective lighting. For property-line lighting, there are 300- to 1500-watt spun-aluminum floodlights, the Form 79 luminaires (with the VR unit specially designed to direct a large portion of the light along and within the fence line), or the new Fresnel lens unit. For area lighting, select wide-angle floodlights or Form 79's. And for supplementary lighting, there's the low-cost Type S-5 searchlight, with a 360-degree pilothouse control.

Another reason is the way they're built. Through sound design and modern manufacturing with up-to-date equipment, General Electric builds quality into every feature. The name "General Electric" on the material you supply will find ready acceptance.

One reason is the complete lighting recommendations available from trained specialists in our local offices, or from illumination engineers in our Illuminating Engineering Laboratory in Schenectady. Haphazard installation of lights will not give economical nighttime protection. So let us give you the help we've given other contractors. It will save you time and money and assure a successful lighting job.

And, another reason is General Electric's extensive distribution system that assures you prompt shipment of floodlights, poles, cable, switchgear, and transformers (if used on defense lighting projects). One source of supply eliminates a lot of unnecessary paper work and often it means you can get equipment sooner.

If your customer is to recommend your service to others, installations must look better and perform better than he expected. And costs must be kept down to estimates. Your request will bring practical help. General Electric, Schenectady, New York.

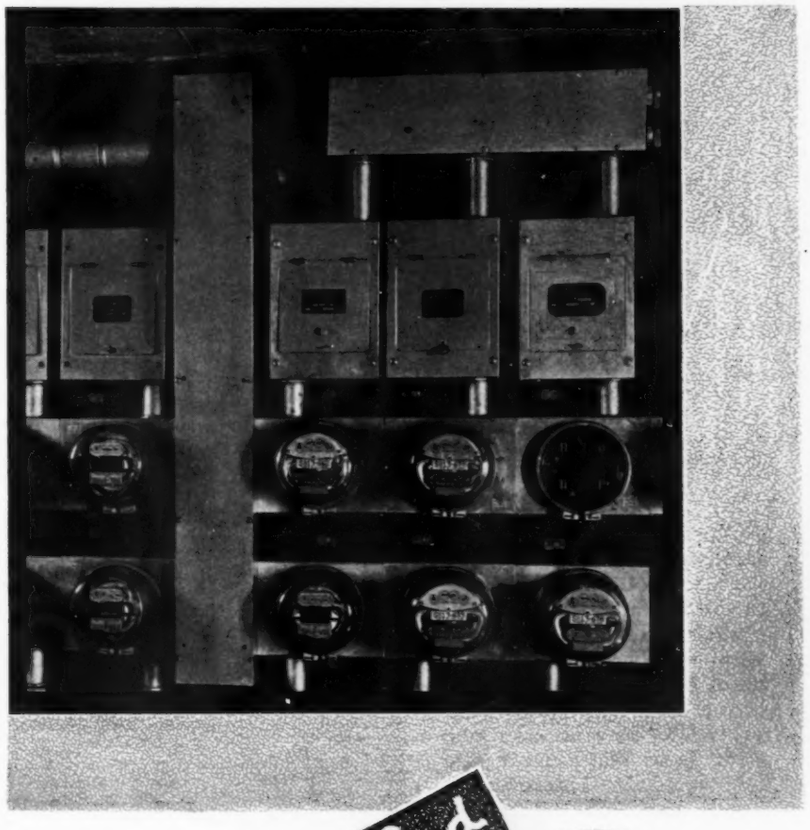
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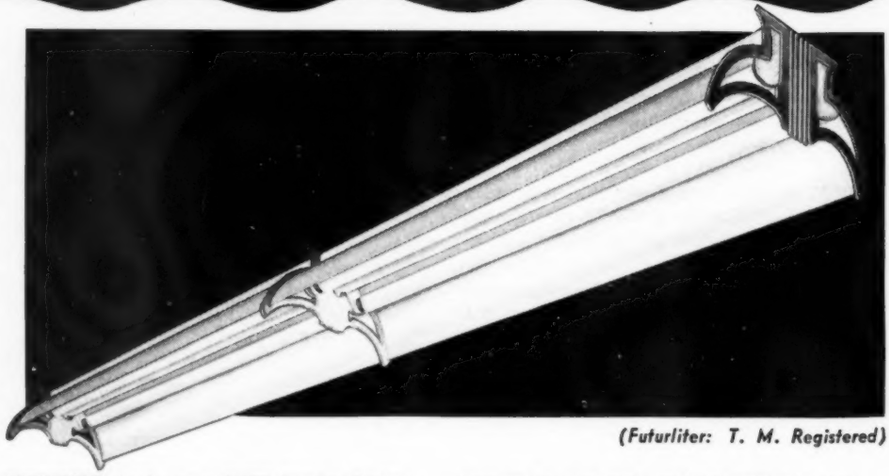
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How to Make SALES ZOOM UP!

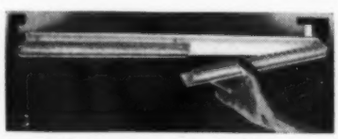


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Electrical Contracting

With which is consolidated The Electragist and Electrical Record

Established 1901

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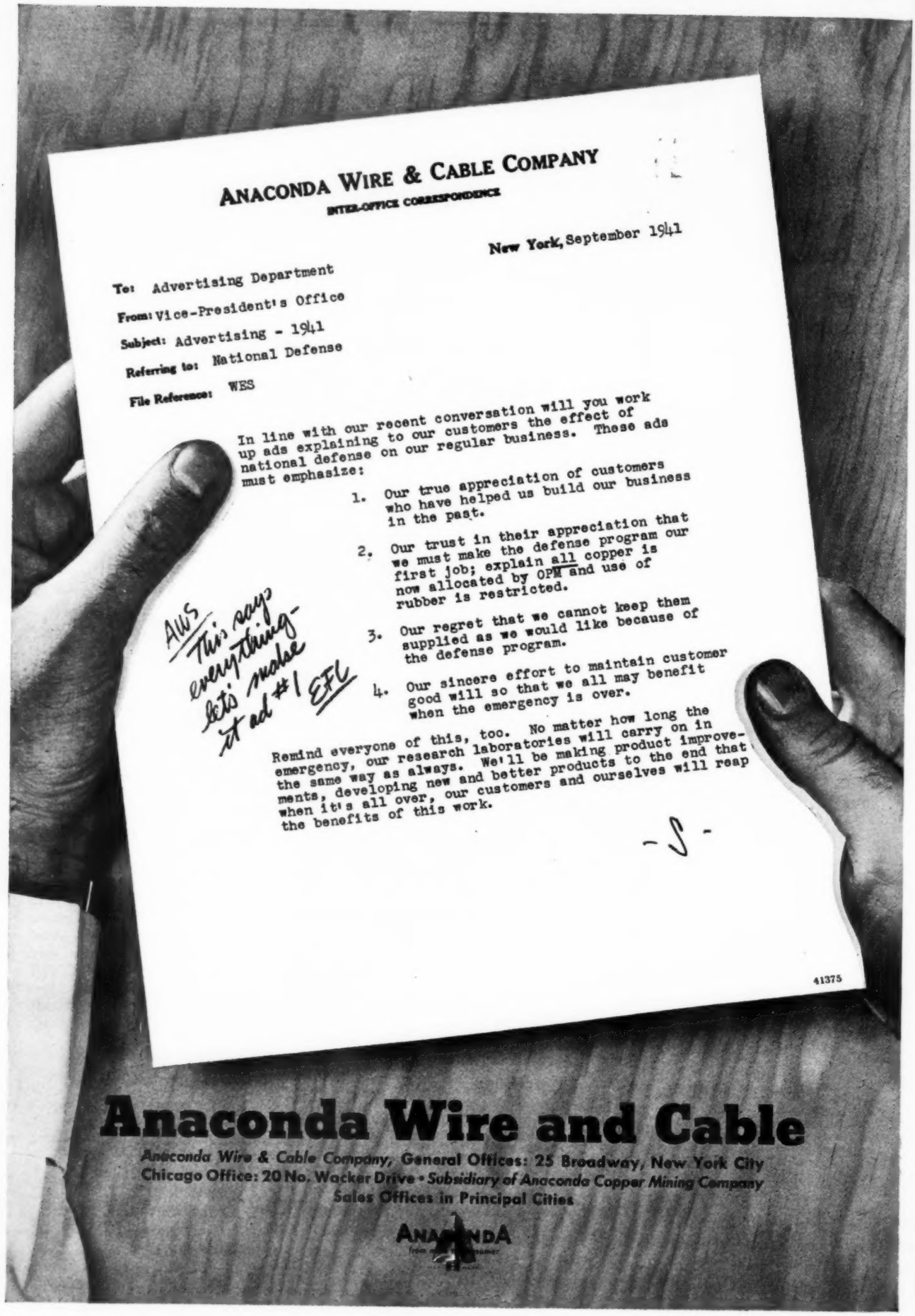


A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction—industrial, commercial, and residential.

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ANACONDA WIRE & CABLE COMPANY
INTER-OFFICE CORRESPONDENCE
New York, September 1941
To: Advertising Department
From: Vice-President's Office
Subject: Advertising - 1941
Referring to: National Defense
File Reference: WES
In line with our recent conversation will you work up ads explaining to our customers the effect of national defense on our regular business. These ads must emphasize:
1. Our true appreciation of customers who have helped us build our business in the past.
2. Our trust in their appreciation that we must make the defense program our first job; explain all copper is now allocated by OPM and use of rubber is restricted.
3. Our regret that we cannot keep them supplied as we would like because of the defense program.
4. Our sincere effort to maintain customer good will so that we all may benefit when the emergency is over.
Remind everyone of this, too. No matter how long the emergency, our research laboratories will carry on in the same way as always. We'll be making product improvements, developing new and better products to the end that when it's all over, our customers and ourselves will reap the benefits of this work.
-S-
AWS This says everything- let's make it ad #1 EFL
41375
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Anaconda Wire & Cable Company, General Offices: 25 Broadway, New York City
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ANACONDA

Electrical Contracting

OCTOBER, 1941

E Pluribus Gangem

IN THE BEGINNING IT WAS NOT E PLURIBUS UNUM. The idea started in the wolf pack as *e pluribus gangem*. The cave men took it up. It was handed down to the nomad tribes, the walled cities. It was a good idea—to hang together for attack and for defense.

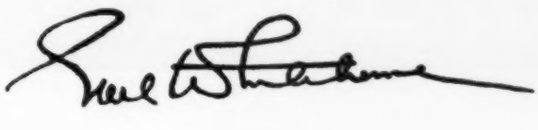
THIS GOOD IDEA HAS NOW BECOME a basic principle of society, a bulwark of civilization. No longer belligerent, it calls for cooperation to get things done for order and for progress. We all believe in it. And I like to fancy what this good old *gangem* rule might do for the electrical construction industry.

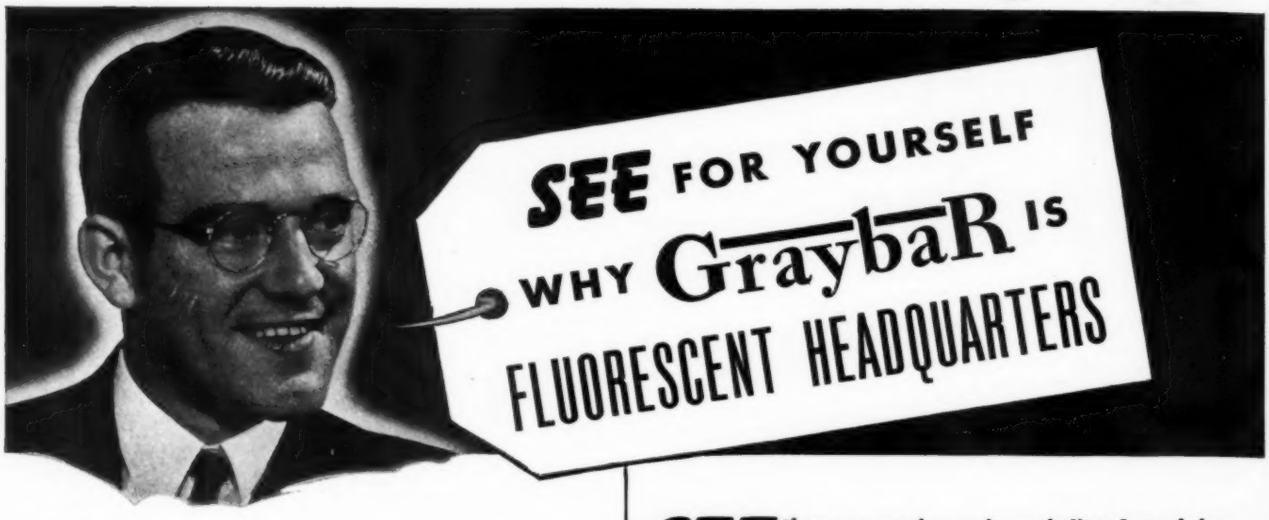
JUST FOR THE FUN OF IT, suppose that, say, 4,000 unexpected contractors should turn up at Houston this month. And suppose they should join NECA and attend the meetings and discuss the industry's needs and say what they want done. Here would be an association membership of better than 5,000 ready for vigorous action.

WELL, WHAT WOULD HAPPEN? It is interesting to contemplate the possibilities. For with the vocal and financial strength of an adequate membership behind a well organized progressive program both the *unum* and the *gangem* power goes to work. Strong city associations everywhere could take up the local work. Strong state associations could bring creative influence to state affairs. And all would give responsibility and power to the national association in its negotiations with government, labor and other industries.

WE TALK ABOUT STATE WIDE INSPECTION, about uniform licensing laws. We watch the growing problems of apprentice training, code improvement, market development and trade relations with manufacturers, wholesalers, power companies and general contractors. But we need the strength of numbers, the voice of many, if we are to accomplish much. And 5,000 men are 10 times stronger than 1,000.

WE NEED STRONGER ORGANIZATION and leadership in the electrical construction industry. But we can't have it without numbers. Where are the 4,000 who will step out and bring NECA this power in their own behalf? It will clear the path for everybody's progress. We can all go forward in defense work and with re-wiring and re-lighting and our other plans. With 15,000 electrical contractors to draw from, it can be done.





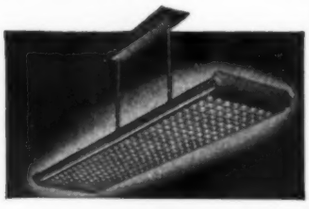
SEE FOR YOURSELF WHY GraybaR IS FLUORESCENT HEADQUARTERS

SEE this comprehensive 86-page "tell-all" Fluorescent Lighting Catalog



Its 86 pages are crammed full of essential fluorescent facts. It contains illustrations . . . light output figures . . . distribution curves . . . dimensional drawings . . . specifications . . . list prices . . . for more than 70 industrial and commercial fixtures. In addition, it answers questions about fluorescent lighting, discusses servicing and tells how to design a lighting installation for any desired illumination level. For a copy of Catalog L-74, call your local GRAYBAR office or Representative.

SEE that your supply source can furnish the exact type of unit you need



GRAYBAR offers industrial fluorescent units for general or localized lighting, normal or high illumination levels, open or enclosed, including Benjamin "Streamliter" and "Lite-Line", Wheeler "Day-Flo" and other types with "Fleur-O-Lier" approval. Also commercial types by Wakefield, Silvray, Curtis, Day-Brite, Mitchell. For up-to-the-minute information on new types, call GRAYBAR. Call GRAYBAR, too, for General Electric Mazda F (fluorescent) lamps, Underwriters' Approved Accessories, ballast transformers, starters, and the like.

SEE these experienced specialists for advice on commercial and industrial lighting



GRAYBAR has a staff of lighting specialists with years of practical experience in fitting lighting to the job — particularly skilled on industrial lighting problems where seeing tasks are highly critical. These men are available to work with contractors, plant engineers or utility lighting engineers in solving problems of glare, shadow control, color discrimination and other factors essential to well engineered lighting.

SEE how this nationwide distribution network can help meet your needs



GRAYBAR has more than 80 distribution points from coast to coast with local stocks of most of the things you need for installation, extension or maintenance. Adequate resources and skilled management help GRAYBAR to stock its warehouses so as to serve you with the least possible delay and the human minimum of "mix-ups". Right now, local GRAYBAR managers are doing their best to anticipate customer needs.

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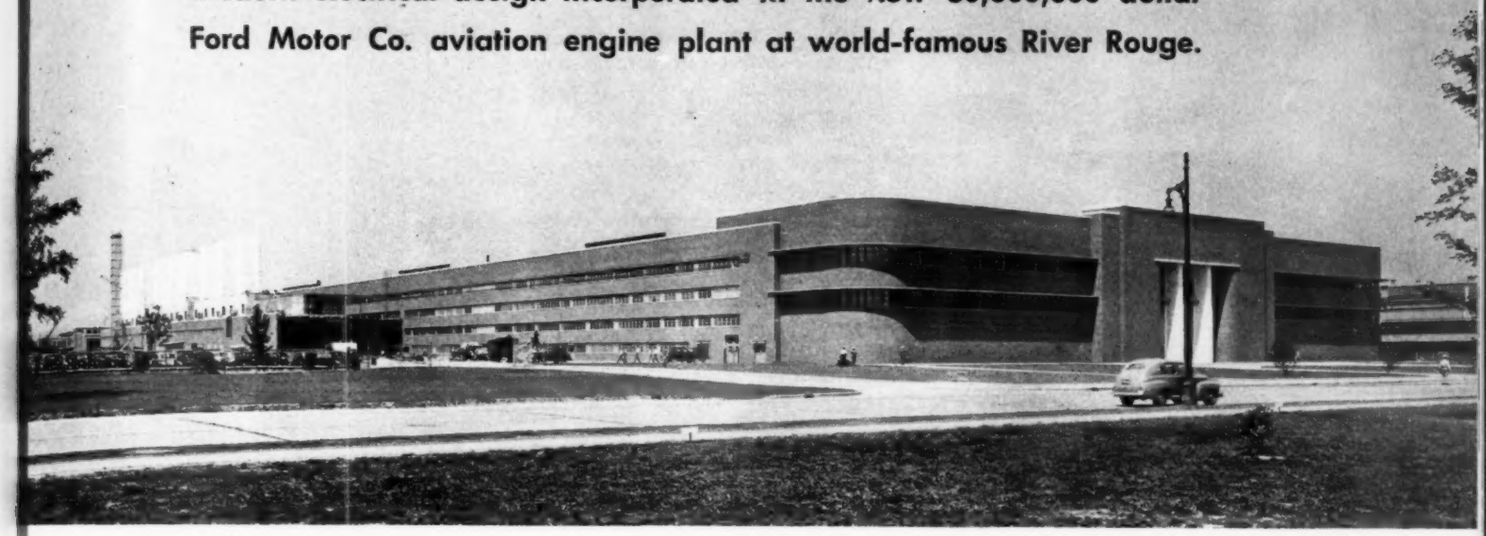
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HEADQUARTERS for FLUORESCENT

LAMPS—ACCESSORIES—REFLECTORS

GraybaR QUALITY *Everything Electrical* GraybaR ELECTRIC COMPANY

Underground substations, copper wrapped bus cables and column distribution cubicles are some of the important developments in modern electrical design incorporated in the new 30,000,000 dollar Ford Motor Co. aviation engine plant at world-famous River Rouge.



Ford Uses Electric Tunnel

THE Ford Motor Company aircraft engine factory is the newest and finest building in the great River Rouge industries at Dearborn Michigan. It exhibits further progress in modern factory design in an industrial area already famous for advanced construction methods. Particularly important to electrical men in these times are the methods used for distributing the vast quantities of electrical energy that enter the mass production process.

The core of the electrical distribution system in this modern plant is an underground electric tunnel through which the energy from a series of strategically located underground substations is routed to hundreds of distribution cubicles in the production area above. Main feeders for five power and light systems and several signal systems are concentrated in this well protected and out-of-the-way tunnel providing direct and efficient circuit runs with convenient centralization of the main feeder protection. The electrical systems are easily accessible to maintenance crews yet out of reach of unauthorized tampering.

The tunnel is 7 by 10 feet in cross-section and extends down the center of the building below the first floor slab. Secondary busbars from adjacent substations are connected to the main power busbar system at junction boxes on the tunnel ceiling. The system consists of multiple circuits of 3-conductor 750,000 cm, cables of special design enclosed in a heavy spiral copper sheath and carried exposed on hangers spaced 5 feet apart between junction boxes.

Four cables in multiple form the main 480-volt power bus, paralleled by an auxiliary tie bus of five cables. Breakers at each substation permit transfer of the load from one station to another through the tie bus.

At 25-foot intervals along the east tunnel wall are splice boxes and master cabinets. The "M" cabinets are distribution panels with 800 ampere mains, one 400 ampere branch and four 200 ampere branches, from which power feeders are run to the plant distribution panels.

Master cabinets for 240-volt power, hi-cycle and d.c. are mounted on the opposite wall of the tunnel with conventional conduit and wire feeds from the substations. Tie circuits link the station secondaries to allow load transfers on the lighting, 220-volt power and hi-cycle circuits.

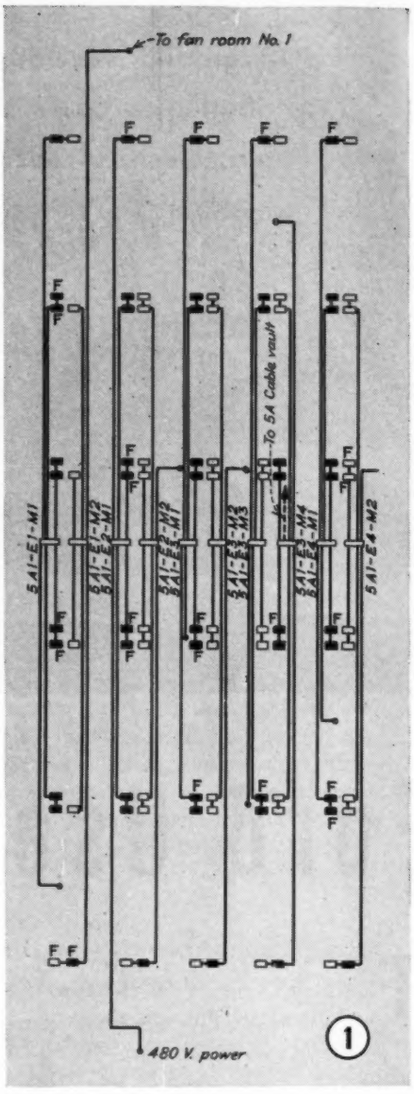
The building is rectangular, 1400 feet long by 360 feet wide, with an adjoining test wing. The production area is two stories high, with column spac-



TUNNEL DISTRIBUTION. *This long tunnel under the first floor slab and down the center of the building contains splice boxes and master cabinets at 25-ft. intervals. Cabinets are fed by overhead cable buses and in turn feed column cubicle distribution centers on the floor above.*



COLUMN CUBICLES *of streamlined design surround columns at more than 600 distribution centers in the plant. All four sides contain standard panelboards. East and west are 480-volt power; north alternate lighting, d.c., hi.-cycle and 240-volt power; south panels are generally spares.*



ing 25 by 30 feet. It is fully air conditioned with electrostatic air cleaning and lighted with fluorescent units throughout.

Underground, high tension, primary service enters the main substation on three circuits at 13,800 volts, three phase, 60 cycle. The service cables connect to three sets of busbars linking the primary distribution switchgear. The busbars are paralleled through breakers and a synchronizing bus tie with reactors in the tie circuits to limit the possible short circuit current within the interrupting capacity of the switchgear.

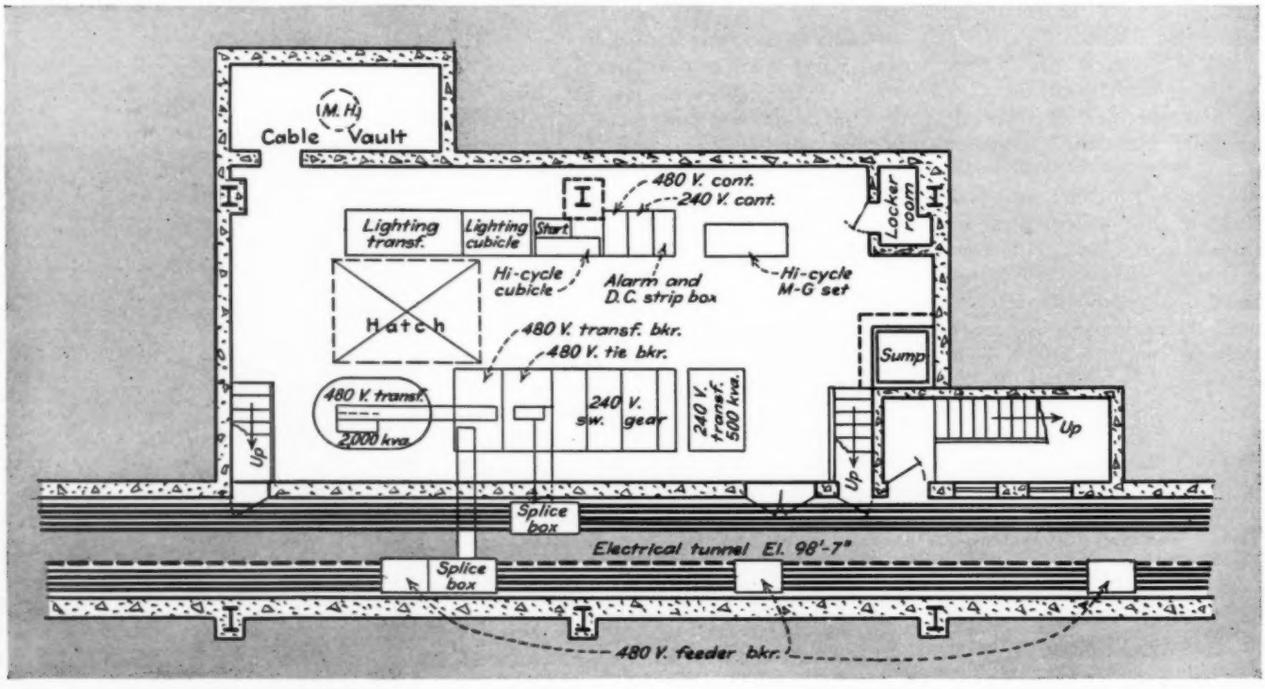
From the 13,800-volt breakers, circuits are extended to six underground substations. These are spaced approximately 250 feet apart along the electric tunnel which runs down the center line of the building.

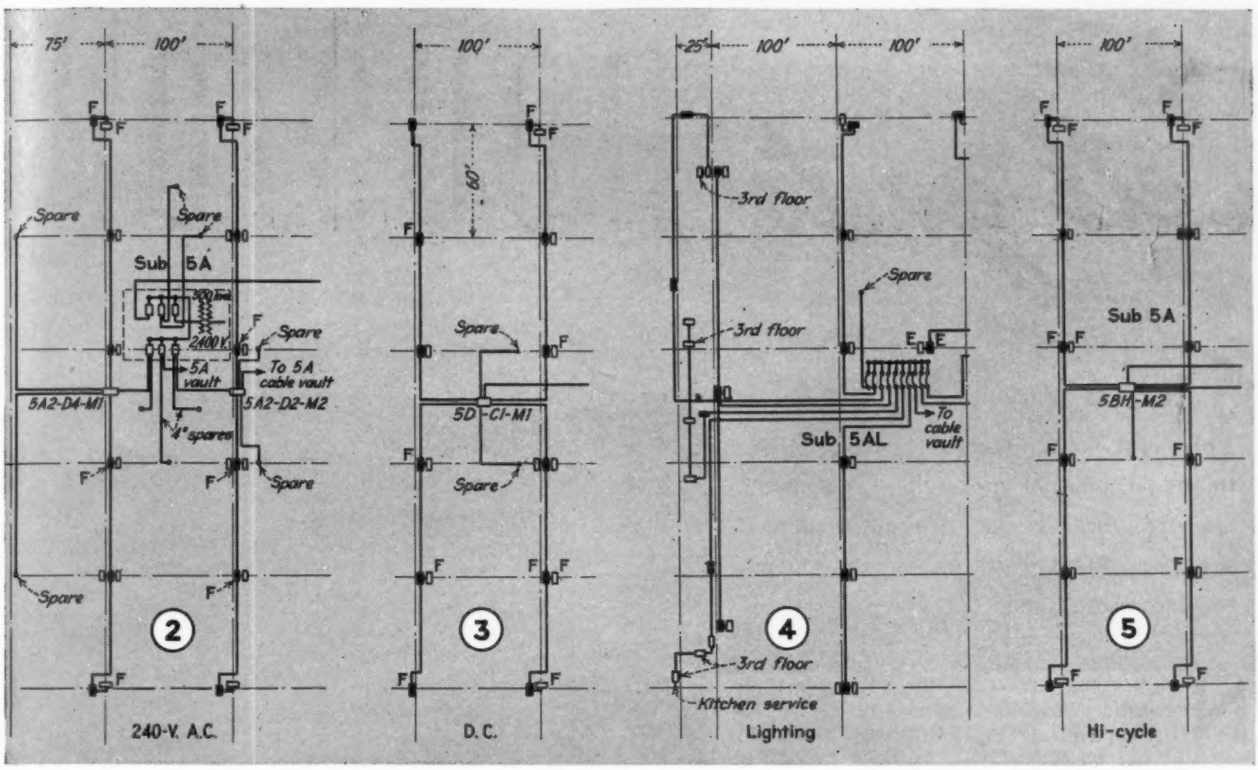
A typical substation is 23 by 50 feet and 14-ft. 6-in. high, with an adjoining 6 by 14-ft. cable vault. Primary voltage is transformed and connected to provide energy to the following four secondary systems.

1. Power at 480 volts, 3 phase, 60 cycle, 2000 kva.
2. Lighting at 120/208 volts, 3 phase, 4 wire, 60 cycle, 500 kva.
3. Heating and miscellaneous power at 240 volts, 3 phase, 3 wire, 60 cycle, 500 kva.
4. Hi-cycle power at 240 volts, 3 phase, 3 wire, 180 cycles, 50 kva.

Underground feeders from a nearby building provide 230 volt d.c. to a fifth distribution system. Four 3000-kva. transformers, associated switchgear and a reactor-controlled tie bus provide 2400 volts, 3 phase, 60 cycle for air conditioning and engine test stands.

UNDERGROUND SUBSTATIONS *are out of the way and fully protected. A typical plan shows the compact and well arranged layout.*





TYPICAL PORTIONS *of schematic feeder diagrams illustrating the variety of electrical services to the production area.*

1. *480-volt power circuits serve two panels at each column cubicle.*
2. *240-volt a.c. power for heat treating and welding.*
3. *230-volt d.c. serves a number of special processes.*
4. *208/120-volt circuits handle the finely engineered fluorescent lighting.*
5. *240-volt, 180 cycle, power serves numerous high speed tools.*

The large 2400-volt transformer capacity is required to handle large quantities of power fed back into the system from the engine test equipment.

Transverse feeders from master cabinets in the electrical tunnel extend to distribution centers in the manufacturing area. These centers are column cubicles, streamlined structures surrounding the building columns with standardized panelboards on all four sides.

The building columns are on 25- by 30-foot spacing, with cubicles surrounding each column in rows B, D, F, H, K and M on the first and second floor totaling over 600 distribution centers.

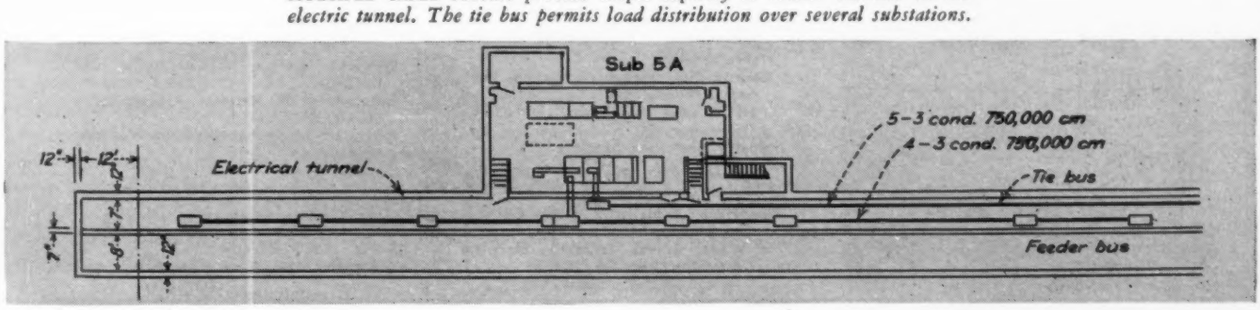
In general, the east and west faces of the cubicle contains two 480-volt power panels, each with 200 amp. mains and 8 branches. A 4/0 feeder in 2½-inch conduit serves each two panels from the "M" cabinet in the tunnel.

North panels in the cubicles alternate lighting, d.c., hi-cycle and 240-volt power in regular sequence through the building. The south panels are generally spares.

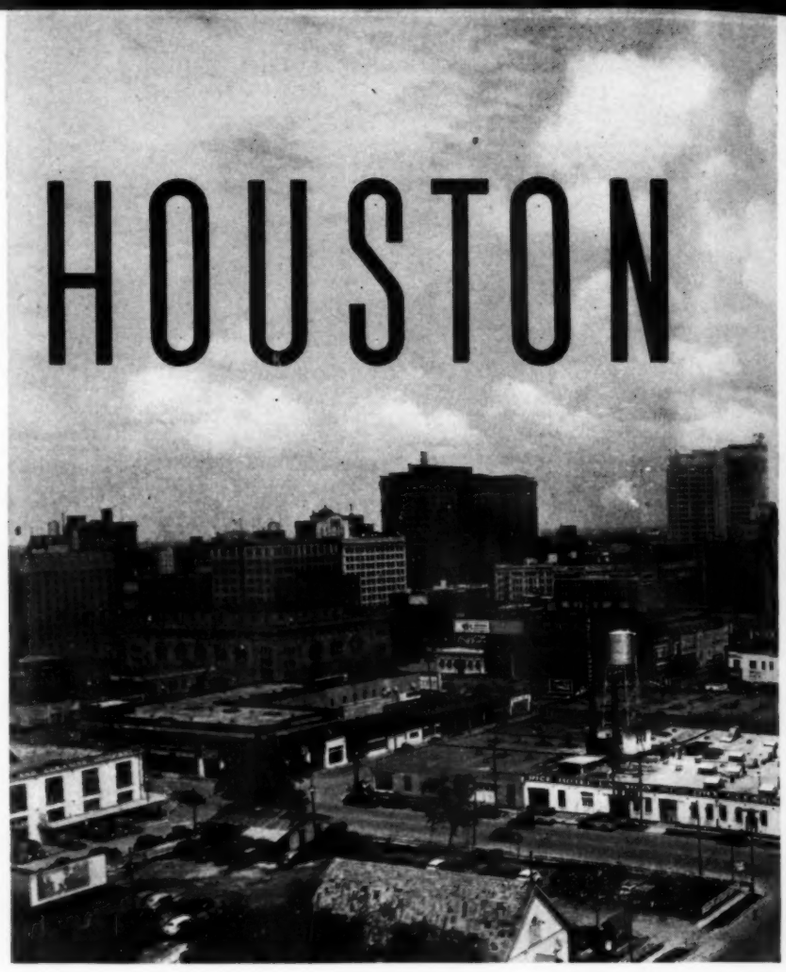
Lighting the manufacturing area, which may be converted to "blackout" operating, are 35,000 fluorescent lighting units each with two 40 watt lamps and high power factor ballasts producing an average lighting level of 40 foot-candles. The air conditioning equipment provides a constant temperature of 75 degrees with controlled humidity and electro static air cleaning.

The plant was designed and built in less than eight months. During part of the underground tunnel work, three shifts of 50 electricians each were employed. As with all Ford buildings, the plant was built under the supervision of the company's power and construction departments of which H. B. Hanson is the head. The building and service equipment was designed by Giffels & Vallet, Inc. and L. Rossetti, associated engineers and architects of Detroit. The electrical contract for work in the superstructure was handled by the John Miller Electric Co. of Detroit.

MULTIPLE CABLE *busbars provide ample capacity to master cabinets in the electric tunnel. The tie bus permits load distribution over several substations.*



Let's go to HOUSTON



This NECA Convention offers two things in unusual measure—Opportunity to discuss our urgent present problems—Travel in Texas and Old Mexico. Don't miss it.

NOT for many years has the electrical construction industry been faced with as many pressing problems and conditions as we confront this fall. The National Defense Program reaches into every angle of our business. Defense construction influences labor relations and price levels everywhere. Priorities bring abnormal factors to the material markets and affect every job in prospect and in operation. There are lots of pressing things for electrical contractors to talk about when they get together.

The coming convention of the National Electrical Contractors Association at the Rice Hotel in Houston, Texas, on October 6, 7, and 8, is opportune. It should be made a vital meeting by the attendance of a large number of contractors and others concerned with electrical construction. Time should be taken, both in and out of sessions for the free, active and purposeful discussion of these urgent issues.

America is driving its factories to increased production of war materials. Where does the electrical contractor fit in? The government is still building camps and shipyards and factories across the land. What new experience is this bringing in terms of electrical equipment? Behind both the military and industrial phases of our Defense activities lies a great movement in housing. What does this mean to us?

NECA CONVENTION PROGRAM

MONDAY MORNING, OCT. 6

Opening Convention Session

"Save Electrical Work for the Electrical Industry"
Robert W. McChesney, President, NECA, Washington, D. C.
"Report of the Secretary"
Laurence W. Davis, New York
"National Defense and Priorities"
John H. Martin, Priorities Div., OPM, Washington
"The Electric Utility and the Contractor"
George R. Conover, Philadelphia Electric Co., Philadelphia

MONDAY AFTERNOON, OCT. 6

I.B.E.W. Employers' Section Session

"Labor Relations"
E. C. Carlson, Chairman, NECA Labor Relations Com., Youngstown, Ohio
Daniel W. Tracy, Assistant Secretary of Labor, Washington, D. C.
"Electrical Workers Part in Promoting the Electrical Construction Industry"
W. L. Ingram, Vice-President, I.B.E.W., Fort Worth, Texas, representing International President Edward J. Brown
"Protecting and Promoting the Electrical Industry"
P. M. Geary, Representative, I.B.E.W. Employers' Section, NECA, Washington
"Council on Industrial Relations"
L. K. Comstock, Chairman, Council on Industrial Relations, New York, N. Y.
"The National Apprenticeship Standards"
E. H. Herzberg, Chairman, NECA Apprentice Training Committee; Chairman, National Joint Committee on Apprenticeship Standards, Milwaukee

TUESDAY MORNING, OCT. 7

Sales Development Session

D. B. Clayton, Chairman, NECA Sales Development Com., Birmingham, Ala.
"Where to Sell"
George Diehl Mateer, Consulting Engineer, Philadelphia, Pa., author of NECA Sales Development Manual.

Industry Statistics Session

A. Lincoln Bush, Chairman, NECA Statistical Committee, New York, N. Y.
"The Place of Statistics in the Contractor's Business"
J. Walter Collins, Secretary, Electrical Contractors Assn. of Chicago

WEDNESDAY MORNING, OCT. 8

"Simplification of Wires and Cables"
George Andrae, Chairman, NECA Codes and Standards Committee, Milwaukee, Wis.
"Estimating and Cost Data"
George W. Patterson, Chairman, NECA Cost Data Committee, Toronto, Ont.
"The Contractor and His Government"
Col. O. R. McGuire, NECA General Counsel, Washington, D. C.

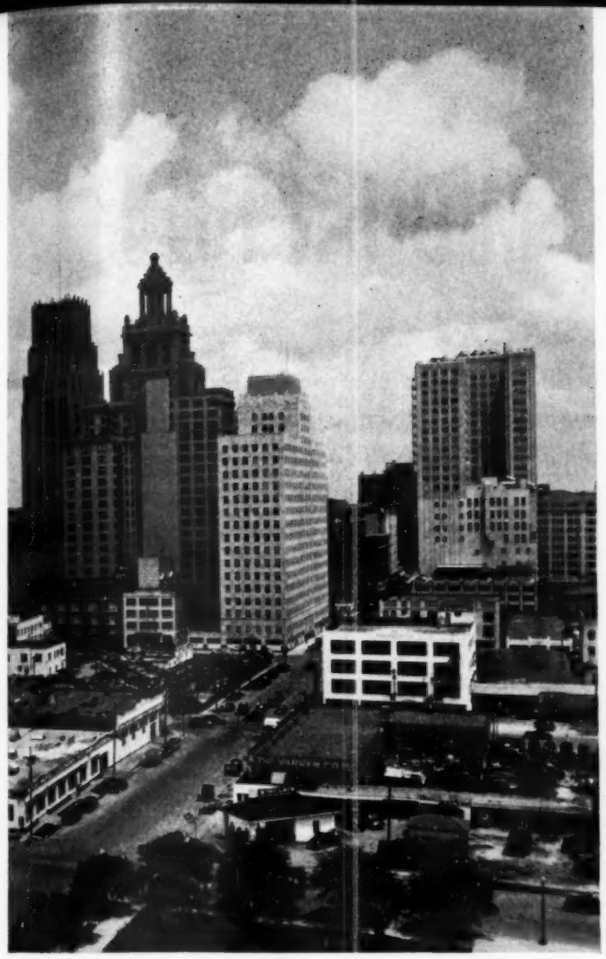
WEDNESDAY AFTERNOON, OCT. 8

Closed Business Session for Contractors Only to consider—

Proposed changes in Constitution and By-Laws
Endorsement of National Apprenticeship Standards
Action on Recommendations for Honorary Membership
Elections

WEDNESDAY EVENING, OCT. 8

Annual NECA Banquet
Presentation of James H. McGraw Award





ULTRA-MODERN BUILDINGS *dot the landscape of Houston's business section. Outstanding example is the new City Hall, (above) latest addition to the architectural enhancement and beauty of this famous city of the Lone Star State.*

These things will be described by men who have been occupied in their development, contractors present who have been busy with this work. Their opinions may be invaluable to you in your future concern with the national campaign. You should not miss it.

The convention program will bring you up to date on what has been done, and is being planned in the broad relations of the electrical construction industry with labor, including provisions for apprenticeship training. It will report on our relations as an industry with the Federal Government and show much good work done. It will discuss our markets, our methods, our opportunities.

Houston is a delightful convention city. It is an important visit in any man's life. For Houston is an ultra-modern industrial town, distinctive in character and typical of this great booming country of Texas. Tall office buildings, clean streets crowded with traffic, fine stores and parks and an industrial area of fine factories bespeak the wealth and activity of this famous city. Its ship canal makes it literally a gulf port, though tide water lies some sixty miles away.

And round about is a fringe of residential developments of great beauty and interest. For here oil-wealth has given expression to some of the finest home architecture to be seen in America, displayed in a landscaping that delights all eyes.

To the stranger in Texas, there is a spirit in Houston that makes itself felt at once; part of the atmosphere of this great state that a good train needs two days and nights to span. And through its windows you see everything from semi-tropic vegetation in the east, through grass, arid hills, grease bush, mesquite and cactus to painted desert. It provides plenty of interests and surprises to make it good travel. And the sign of the electrical man is everywhere.

Then, as you know, the convention will be followed by a fascinating nine day tour to Mexico City and the tourist meccas thereabouts. The Convention starts October 6 and continues for three days. The Mexican tour begins on October 9th and offers a rare opportunity to see this ancient country with its relics of Aztec culture, and its Spanish background.

Don't miss the NECA convention, the 40th anniversary of the organizing of the association. Make it combine a business investment in contact with other electrical contractors from the great southwest and a pleasure trip that you will long enjoy in retrospect.

HISTORIC LANDMARK *is the imposing San Jacinto Memorial, near Houston, which commemorates General Sam Houston's victorious fight for Texas freedom. The shaft is 12 feet higher than Washington Monument.*





MANAGEMENT COMMITTEE *determines the policies and makes plans. (Left to right) O. F. Burnett, Jr., A. J. Harmon, J. R. Strom, A. Fries, Jr., Wm. McGuineas and O. F. Burnett, Sr.*

COMBINING

Four leading Chicago contractors form a joint venture to handle the huge Buick aviation engine plant job, pooling capital, engineering experience, tools and man power resources in an all-out effort to speed national defense.

By W. T. Stuart

DURING the spring of 1941 there were a number of defense construction jobs in prospect in the Chicago area. There was the usual jockeying for position and favor, with rumors of price rises and labor scarcity and profits and risks. A new aviation engine plant, for instance, would run a million and a half dollars and must be completed in ten months.

Four of the leading electrical contractors in the Chicago area looked upon these projects as more than business opportunity. Here was also a challenge to the organization efficiency and capacity of the electrical construction industry.

They consulted legal counsel, cleared the decks and went after the contract for the Buick aviation engine plant in nearby Melrose Park. The ink was scarcely dry on their agreement forming a joint venture, designated for convenience as the Associated Electric Construction Co. (Not Inc.), linking the Fries-Walters Co., Harmon Electric Co., Kelso-Burnett Electric Co. and United Electrical Construction Co.

The first problem to face the cooperative group was estimating procedure. When the Buick plans were obtained they were divided among the estimating offices of the four companies. In each office the quantities were taken off and compiled on summary sheets. Pricing sheets were then made up with material prices and labor units extended and totalled. The portion of the work delegated to each office was then tabulated on a partial recapitulation form and at a joint conference brought together and totalled. A thorough overall check weeded out minor duplications or omissions and finally at a meeting of the management committee, the four companies, the bid price was determined.

Within three weeks of the preliminary arrangements and only 10 days after receiving plans they submitted a bid on the Buick aviation plant. In another three weeks they held a contract for $2,000,000 worth of highly complex electrical construction work.



MATERIAL ORDERS *are routed by Assistant Purchasing Agent H. L. Winograd, who wields an A-1-A priority for the project.*



DIRECT MANAGEMENT *of the electrical wiring installation is in the capable hands of Assistant Works Manager John Adamson.*

The management committee consisting of Oliver F. Burnett, Jr., chairman, A. Fries, Jr., William McGuineas, J. R. Strom and A. J. Harmon, tackled the monumental task of planning with the job and organizing the working facilities. The committee selected A. Fries, Jr. to be the works manager, John A. Adamson as assistant works manager, J. R. Strom as engineer, H. W. Curtis as auditor, Wm. E. Pietsch, superintendent, and located the official headquarters of the company at the field office on the project in Melrose Park, Ill.

For engineering work and layouts the engineer is authorized to requisition services of the engineering staff and draftsmen of any or all of the individual companies, as they are needed, giving a large potential capacity of experienced electrical construction engineers available to the project. As the normal complement of four men will be adequate to keep the work moving on schedule, this arrangement provides a large "overload capacity" capable of handling any contingency which may arise. In a similar way, the capital resources available to the work, coming from the four companies, are adequate to fulfill the needs of the project.

Tooling a modern electrical construction job of this size would be a tough problem for most contractors. But the "adventurers" worked out a unique and yet simple system to make tools available. The works manager is authorized to requisition any tool from the full tool list of all four companies.

Tools are distributed around to project from the central stockroom. Heavy power tools are located in convenient centers and moved as the work progresses. Hand tools are checked in and out of the stockroom each day. Minor

for Defense Construction

repairs and servicing can be handled at the tool crib. The tools, ladders, scaffolding and other equipment are distinguished from similar equipment of other trades by burned-in insignia and bright colored paint.

The shortage and consequent delay in obtaining needed power tools was eased by purchasing used equipment and rebuilding the machines in the Harmon Electric Co. shop. Rolling scaffolds and special hoists for handling busbar duct systems were built especially for the job. Power tools already requisitioned for the work present a formidable list.

The system which provides for material purchasing, handling and delivering is headed up by Oliver F. Burnett, Jr., purchasing agent, and H. L. Winograd, assistant. Purchases for the Buick project have a priority rating A-1-A, way up on top of the list, but nevertheless, with the prevailing demands of defense construction, even at this rating some delays are inevitable.

The purchasing methods applied are quite similar to other commercial or industrial contract jobs. To speed delivery, some major equipment items were ordered before the contract was let. However, they are billed and handled through the contractor. Otherwise, the group exercises the privilege of selecting materials for the work within the limits of the specification requirements and approval of the architect.

Materials are purchased f.o.b. the job and distributed by a handling department from a large central storeroom. Three trucks move materials from the unloading areas around the job. Pickup items are handled on requisitions turned in twice a day by the foremen and delivered from the stockroom.

For cost control, all materials enter stock and are charged out on the job by requisition. The original requisition is priced and extended and cost reports prepared weekly.

Labor operations are in charge of the works manager through the superintendent. Mechanics are divided into four complete crews each of which act as a unit under an individual general foreman. The work is further subdivided by operations and by areas, and crews are reorganized as each step in the construction is completed.

Key men from each of the four electrical contracting companies were made available to the group, and distributed over the job. Mechanics were hired from the local union at the site and the total crew now approaches 250 men, and will probably reach 300 at the peak of the job. Already on this project there is a certain spirit of extra effort and extra teamwork that marks the well organized and well directed job.

The cooperative plan has already proved itself to be capable of extraordinary efficiency and at the same time it is relieving the four shops of individual undertakings so large as to disorganize and overload their highly developed job handling procedure. When the job is completed the venture will be dissolved.

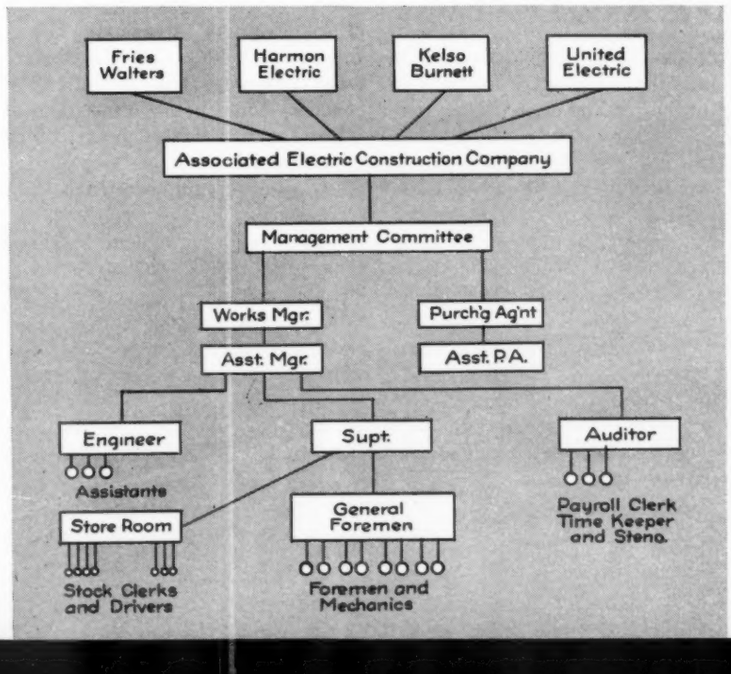
The joint venture may prove to be a potent instrument in the hands of the electrical construction industry to throw unlimited resources into the national defense construction program. Its widespread use will make unnecessary the creation of huge individual companies which cannot be readily absorbed in a post-war economy. This four company venture is therefore an historic event of vital importance to national defense and an important contribution to the inevitable post-war economies of the electric construction industry.



AUDITOR CURTIS *handles the accounts and payrolls, supervises a large staff of clerks and timekeepers.*

ENGINEER STROM *(right) and a corps of engineers and draftsmen handle the engineering and layout. Superintendent Pietsch directs the General Foremen and the stockroom crew.*

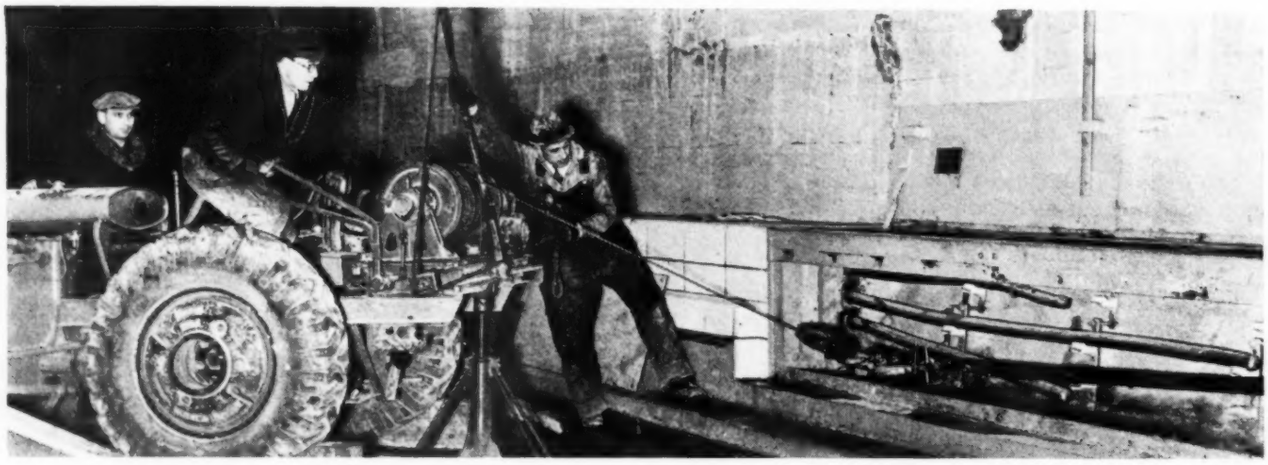




OPERATIONS DIAGRAM *showing the lines of authority on the project. The Works Manager and the Purchasing Agent are also members of the Management Committee.*

Fifty Ideas That Speed the Work

Speed is the keynote of the construction industry today. And the electrical contractor must keep in step with modern methods. Here is a group of time-saving ideas gathered from contractors, large and small, throughout the country.



LONG HARD PULLS *of heavy cables are easily and quickly made with the assistance of tractor-mounted power winches. Tractor speeds large-area jobs.*

THE rapid pace of modern construction demands the services of "specialists" in every branch of the construction industry. But the difference between ordinary and specialized work lies largely in the way it is handled. So the term "specialist", as applied to the electrical contractor, implies that he has the experience, background, equipment, personnel and the organizing ability to do a quality job in record time.

The following collection of ideas has been drawn from all parts of the country and grouped according to their characteristics. They have been used by contractors, large and small, to speed up various kinds of electrical construction work. They are arranged in the logical sequence of the job operation, from the time the equipment arrives on the job site until the last fixture or motor is connected. They are presented for their suggestive value.

Read them with an inquiring mind. Use those that may help you save time on some job you may have in hand. Or some may be permanently introduced as time saving methods in your regular construction schedule.

A. JOB EQUIPMENT

1 Duplicate tools should be sent to every job, the number depending on the size of the job and crew. Much time otherwise lost in back-tracking for a tool, borrowing it from the other fellow or waiting until he is through with it, can be saved.

2 The selection of the equipment sent to every job should be carefully planned. As many useful power driven tools as possible should be provided, the number and types depending on the size and type of the job under construction. Bare hand labor cannot compete with well chosen tools ready for each operation.

3 Steel fabricating equipment, such as punches, drills, shears and power saws, is a necessity in almost all construction jobs today. For there are always conduit hangers and equipment mountings to be made from channel, angle or flat iron.

4 Where floor areas are large and surfaces smooth, scaffolds, reel racks, truck elevators, tool boxes and work benches should be on wheels and easily rolled about. Portable motorized equipment should also be employed. It's easier to push equipment than to lift it.

5 In electrical construction, where steel cannot be cut or drilled, use electric welding. It has proved particularly helpful for mounting conduit hangers and fabricating equipment racks. It is more rigid and faster.

6 Pipe pushers, for under-roadway or under-building conduit installations, save

much time and expensive breaking up of floors and pavements. When such equipment is not at hand, the plunging mechanism of a hydraulic bender will sometimes do the trick.

7 For underground work in large areas, a truck equipped with winch, boom and a reel trailer can speed up material spotting and cable pulling operations. The reel trailer can be left at the feed-in box while the truck goes on to the pulling end of the run and hooks on.

8 Use ladder trucks for outdoor work on overhead lines to save many hours of time. A two-man crew, one on the ladder and one in the truck can accomplish more in less time than several similar crews on foot. And a full day's supply of materials can follow the crew and avoid back-tracking for more.

9 It is often wise to sub-let trench and polehole excavations in rocky areas to a blasting contractor. He has the equipment and knows how to do it. It is quicker, safer and in many cases less expensive to do it this way.

10 Convenient communication saves money on a large job site. A microphone in the field office and loudspeakers placed at strategic points throughout the area provide for rapid, last-minute instructions to specific crews. Field telephones may supplement this system.

B. JOB LAYOUT

11 Color coded electrical plans speed up construction work by making it easier for the mechanics to read the plans. Varied colored crayons are used to indicate different sized conduit runs or different electrical systems. This is especially helpful on intricate control circuits where the colored crayons can correspond to the color coding of the circuit wiring.

12 The confusing unwieldiness of large drawings can be avoided by the use of "patch drawings." These are small letter-size sections of a large drawing, showing several bays of large jobs done to exact scale. They lend themselves to ready revision and, upon completion of the area, can be assembled to correct the master plan.

13 Plans can be made weatherproof by pasting the blueprints on a large sheet of fibre board and covering the face of the print with a coat of clear shellac. Ordinary dirt and grease can be easily wiped off and the plans will not blow away or become soiled or torn.

14 Delayed delivery of special materials can be avoided by using a "progress, material, cost chart" listing the quantity, description and supplier of these items with date ordered, promised delivery date and space for date received. The superintendent can then check up daily and jog the supplier from time to time to get needed material.

15 Time and money can be saved on material requisitions from foremen on out-of-town jobs by supplying them with a compact set of catalogs from which to write up requisitions to be mailed to the home office. Foremen can then give catalog numbers and specific data on what they require.

16 Unobstructed conduit runs in steel structures can be planned in advance by consulting the structural steel plans and having the necessary holes cut in the steel members at the fabricating plant. Any reinforcing required can be done by the fabricators. It also pays to consult other mechanical drawings and make sure of adequate clearances with other systems.

17 For quick measuring of conduit for prefabricated sections, a 15- or 20-ft. rule painted or marked on a clear section of the shop floor will save much time usually lost in fumbling with folding rules. Each foot is marked with a numeral and fractions with a dash. A similar rule can be set up on the shop wall to measure riser heights. Prominent markings should indicate frequently used standard heights on a specific job.

18 Use conduit and cable installation pull boxes wherever practicable, especially in runs where numerous offsets and awkward bends are encountered. They eliminate conduit bending labor and, if made large enough, cut the cable pulling time considerably. They also insure against possible cable damage.

19 To help in connecting plug fuse type lighting panels and to speed up later trouble shooting on the circuits, have all the fuse receptacles in the panels color coded to correspond with the color coding of the branch circuit wiring.

20 For efficient man-hour production, functionalized crews should be set up on large work, the number per crew depending on the size of the job. One crew spots outlets and panels, one fabricates conduit, one installs conduit, one installs equipment, one pulls in wire, one makes all connections and does the mopping up.

REEL TRAILERS FACILITATE *spotting and unreeling of heavy cables on long runs. Leaving the trailer, the truck goes to the pulling manhole and hooks on.*

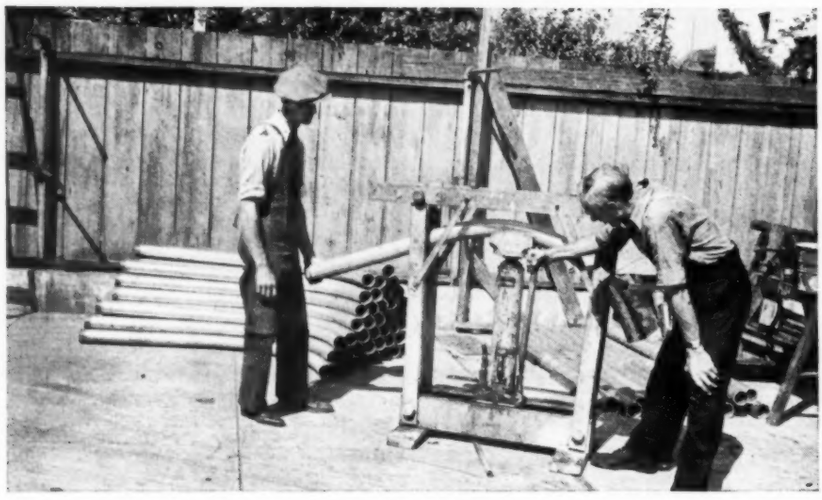


OVERCOME CRAMPED QUARTERS *and wasted man-power by using compact, direct-connected motor driven winches for cable pulling.*



FOLDING TRIPOD SIMPLIFIES *loading and unloading of heavy cumbersome equipment. Reduces time and crew size. Tripod can be assembled or taken down in a few minutes.*





SHOP BENDS SAVE *time. Mass production of fabricated conduit sections in the shop or field speeds construction and saves materials.*

C. CONDUIT FABRICATION AND INSTALLATION

21 To speed conduit fabrication in cold weather, do this work in the home shop or in the heated field shanty where mechanics need not work with gloved hands. Bundles of the prefabricated conduit can then be delivered to the job site and easily installed. On blistering hot days when the sun makes materials and tools too hot to handle, speed up man-hour production by starting the crews earlier in the morning. Then they can knock off in the heat of the day.

22 For mounting exposed conduit on concrete or steel for average ceiling heights, use a double-platform rolling scaffold. The lower platform will carry a pipe machine, tool box, work bench and light for the floor crew to fabricate conduit while men on top platform install the fabricated sections. Portable work benches with electric drill press and hacksaw, vise, conduit and busbar bender saves time on heavy industrial work.

23 Where long lines of lighting outlets are to be suspended in high bay areas, pre-assemble the conduit on the floor and mount it in 30- or 40-ft. sections to pre-installed hangers. A follow-up crew tightens the hangers and fastens the fixture outlets.

24 On jobs where branch circuit conduit runs are identical in each bay, mass production of conduit bends and sections is the best practice. One crew bends conduit and makes up the assembled sections. Another installs. Both speed and efficiency are improved.

25 For dead-ending messenger cable without drilling steel beams, use prefabricated steel clamps, fitted over the flanges of the beams. Tightening a few bolts rigidly secures the clamps and turnbuckles. Long threaded eye bolts on the messenger make it taut. Use prefabricated hangers and support for all equipment mounting.

26 To terminate overhead or underground conduit runs at panels and switchboards before this equipment arrives, use temporary templates with holes drilled to duplicate those of the panel or pull box. When the equipment arrives, conduit will be in place and extensions can be easily made.

27 Distinguish conduits of different electrical systems in a multi-system installation by using color coding, painting conduit terminals at each end of a run with enamel corresponding to a predetermined color schedule. This makes it easier to pull in proper circuits later.

28 While installing outlets in a high bay area, save time and scaffolding cost by mounting the conduit and fixtures and doing the wiring on the roof trusses while they are on the ground. After the steel trusses are erected, home runs can be installed from a catwalk.

29 For mounting heavy steel enclosed bus duct on average ceiling heights, portable power driven elevator trucks used in conjunction with a rolling scaffold saves much time and energy. Working crews on this operation can be reduced to a minimum.

30 To level underfloor duct between preleveled junction boxes, use steel piano wire stretched taut and clamped to the preset junction boxes. The intermediate duct is then blocked up to the level of the wire.

D. WIRE AND CABLE PULLING

31 To unwind heavy reels of cable without jacks and cross bars, use roller carriages. Mount two gravity conveyor rolls on a portable angle iron frame extending a few inches above the ground. Roll the reels onto these frames, one under each reel flange. The reels turn easily on the ball bearing mounted conveyor rolls.

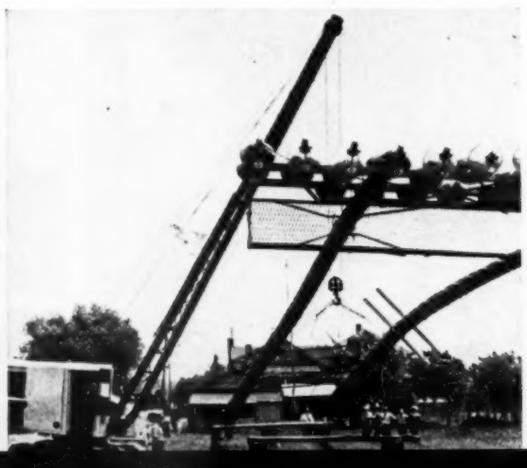
32 In wiring of hundreds of branch circuit lighting outlets at an average ceiling height, two rolling scaffolds can be used in tandem fashion. Let one contain racks for the reels of multicolored conductors which are fed

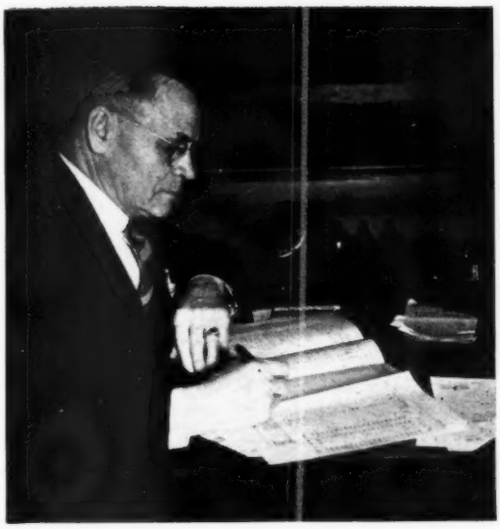
[Continued on page 130]

PIPE PUSHERS ELIMINATE *expensive and slow pavement and floor breaking and excavation. They are quick and reduce labor costs.*



GROUND ASSEMBLIES SPEED *up the job. You can work more efficiently on the ground. Here a crane is lifting a ground assembled floodlight standard into position.*





ELECTRICAL INSPECTORS *can cooperate with defense industry for ready access and quick inspection, says James Galbraith, Detroit Chief, and personal identification is the surest guard against impersonation.*

INSPECTION Under Defense Restrictions . .

Detroit electrical inspectors cooperate closely with industrial executives to provide competent inspection in defense industries.

By James Galbraith
Chief Electrical Inspector, Detroit, Mich.

SEVERAL inspection problems inevitably arise from the restrictions that now prevail in industrial plants serving the federal government in the national defense program. We have them in Detroit. Up to the present, however, restrictions on free access to properties by accredited electrical inspectors have not been severe. It may be expected, however, in important industrial communities, that electrical inspection departments will have to prepare careful rules of procedure in cooperation with industry executives and the interested government agencies to provide:

1 Ready access by accredited inspectors to defense operations without unnecessary red tape.

2 Adequate and positive identification of the inspector.

3 Full protection against saboteurs attempting entrance under the guise of inspectors.

4 Special authority to industrial inspectors to protect industry from unnecessary technical restrictions in providing power to production.

5 Full cooperation in eliminating conditions requiring temporary permissions as quickly as possible.

In our department we are heading toward these ends by simple, but eminently practical methods that any well organized department can readily adopt. Our staff is large, with 25 full-time inspectors in the field, each identified by a badge and a card. The identification card carries the inspector's photograph, signature, the commissioner's signature and a key number. This kind of identification is proof against unauthorized use and the check number provides an additional safeguard.

However, only two of the staff are scheduled for industrials. These two men make all industrial inspections and work solely in this field. Thus they are personally well known to heads of electrical departments and plant superintendents in their own areas. Such personal recognition is by far the simplest and most effective method of preventing imposters from abusing the privileges extended to our department.

This is a considered policy of our department even in normal times. It is doubly important now. These men and I, as head of the department, regularly attend meetings of groups such as the Industrial Electrical Engineers. Everything we can do to put our contacts with key men in the plants on a friendly personal level is fostered because it eliminates unproductive delays in identification, entering the plant, and carrying out the inspection.

Access under personal recognition should not be too severely tied up in formality, even under defense requirements, because its restriction can ultimately cut much of its value. If, for instance, our inspector must spend an hour or more in getting on the job, his productive time is drastically cut and consequently more men must be delegated to the field and the system of direct personal identification is considerably weakened. Paradoxically, as fewer restrictions are placed upon the inspector, the margin of safety against impersonation and sabotage is increased.

Our access to a defense plant is usually through the chief electrician or the plant superintendent. Our men go in through the "front office," identify themselves and ask for the plant electrician by name. If further permission must be obtained, the inspector is accompanied by the electrician to maintain the chain of personal recognition.

Inspectors, everywhere, are extending every effort to give production the right of way. Temporary wiring is permitted to get machines running. Technical defects are not allowed to hold up power. This is right and proper under the national emergency. Nevertheless, it must be understood by inspection departments and industrial executives alike that such defects are dangers which should be promptly eliminated, corrected or replaced by approved wiring. Our method of dealing with this problem is to issue temporary permits which may run 30 or 60 days but which require reinspection and renewal.

Our department, and, I believe, every department in the nation, is ready and willing to serve the national defense effort in every way possible. One of the most direct ways to do this is to provide quick and thorough inspection to insure safety. The better cooperation and understanding we have from industry, the better service we can render. It is equally important that we cooperate and consider industry's special problems.

Maintenance Prevents Trouble

Electrical systems are the heart of production units. They should be kept in A-1 condition to meet the demands of the Defense Program. Guard against shutdowns by regularly checking points where trouble might occur. Use this check chart and keep maintenance ahead of emergency.

MAINTENANCE has always been an integral part of any plant operation. It is synonymous with operating efficiency. For, unless the production system is trouble-free, top efficiency cannot be achieved. However, modern plant maintenance is vastly different from the old "fix-it" concept, where no action was taken until a machine actually stopped or broke down. Then it was "fixed" and all was quiet until another refused to function.

Today there is no place for such a system. Mass production, overloaded schedules, delayed deliveries and the vast National Defense Program demand continuous uninterrupted operation. Shutdowns are taboo. And this means the building up of a carefully planned and executed "Preventive Maintenance Schedule"—a highly organized system of periodic inspections of places where trouble is most likely to occur.

Handymen or jacks-of-all-trades won't do here. The organization must have highly trained men who know electricity and machinery, who know the art of trouble-shooting, who know how to look ahead of trouble and who can remedy it when it does come.

The length of the period between inspections will vary with the type of equipment, the system, the operating cycle, the operating personnel and the production conditions. It may differ with each individual system and plant and when a schedule is organized or revised it should be based on a careful study of the existing conditions.

From the standpoint of the electrical system, the value of such a maintenance schedule cannot be over-estimated. For here is the heart and the life line of the production unit. To allow it to stop is to halt production, delay deliveries and reduce plant capacity. And these are definite "don'ts" during this emergency and in normal times.

Trouble prevention is, in fact, so important that the maintenance crew should not be burdened with too much extension or new work. There are highly specialized contractors who can be of service here.

Organizing a preventive maintenance system simply means picking the proper men and assigning them to their specialized duties, selecting the necessary instruments, acquiring inspection and report forms and adopting a simple, clear cut schedule of periodic inspections. What to do depends on your particular plant. But most plant electrical systems have the possible sources of electrical trouble as outlined below. The check list covers them from service to outlet.

WHERE TO LOOK FOR ELECTRICAL TROUBLE

● Electrical trouble might occur at any one of the places outlined below. Systematic periodic inspection of these points may reveal symptoms of impending trouble and go far toward maintaining uninterrupted plant operation.

CHECK LIST	WHAT TO DO
TRANSFORMERS	
Voltage	Check the primary and secondary voltages periodically with a voltmeter to see that rated values are being delivered.
Load Amperes	Take periodic load tests on the secondary side with an ordinary or recording ammeter to prevent equipment overloads.
Insulation	Take insulation resistance readings with a megger to guard against unheralded insulation breakdowns.
Oil Condition	Periodically check the condition of the oil in oil-cooled units to see that oil is clean and its dielectric strength is maintained.
Oil Level and Temperature	Check oil level and temperature guages daily to see that unit is properly cooled and no overload might occur.
Connections	Make a periodic inspection of all connections to guard against poor contact due to vibration, heat or mechanical or electrical stresses.
Grounding	Periodically check all equipment and system grounding connections. Vibration or corrosion may loosen them.
FEEDERS AND BRANCH CIRCUITS	
Capacity	Determine the size of wire or cable and the type of insulation. Check the N.E.C. table for current carrying capacity.
Voltage Drop	Periodically check the voltage at the panel and end of the feeder to determine the amount of voltage drop in the line. Best results can be obtained by using two voltmeters simultaneously, one at each end of the feeder. Recording volt-meters can be used also.
Load Amperes	Take load ampere readings periodically to guard against overloading the conductors. Clamp on type meters can be used to take readings without opening the circuit. Recording ammeters can be left in circuit to take readings over a period of time.
Power Factor	Check the power factor of the system at regular intervals. For single-phase lines measurements can be made with an ammeter, voltmeter and wattmeter or a power factor meter. Polyphase measurements can be made with two ammeters, two wattmeters and one voltmeter or an analyzer (for 3-phase only).
Insulation Resistance	Take megger readings periodically to check the insulation on the conductors. Weak points can be discovered and remedied before a serious fault occurs.
Ambient Temperature	Check the ambient temperature where conductors are installed to determine if it is below the maximum allowed by the Code for the type of insulation on the conductors. A thermometer will do.
Conductor Temperature	Check the conductor temperature frequently.
Splices and Taps	Make a periodic inspection of all splices and taps in the feeder and branch circuit conductors. Loose connections make bad contact and cause excessive heating and pitting of the conductor. Eliminate causes of excessive electrical and mechanical stress.
Mechanical Protection	Check over the conduit and raceway system for loose mountings, couplings or connections. Make sure that all conductors are amply protected from mechanical injury.
Grounding	Periodically check the system and equipment grounding to make sure all joints and taps are secure. Check conduit and raceway couplings and entrances to boxes and fittings. Make sure ground jumpers are at all expansion joints.
PANELBOARDS AND SWITCHBOARDS	
Knife Switch Contacts	Make a monthly inspection of all knife switch contacts and hinged points to see that they are tight, clean and not burned or pitted. Inspect more often if switch is opened and closed frequently.

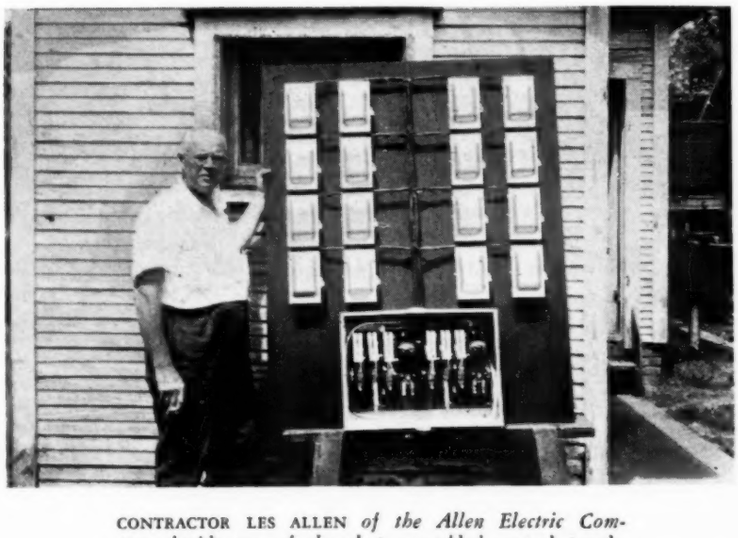
CHECK LIST	WHAT TO DO
Circuit Breaker Contacts	Inspect all current carrying parts each month. Check for pitting, dirt, oil and loose connections. If breakers are used frequently, do this more often.
Circuit Breaker Operating and Tripping Mechanism	Make sure that the mechanism is operating freely and will interrupt the circuit when necessary. Replace worn parts that might jam during emergencies. Period of inspection depends on frequency of operation.
Bus Bar and Lug Connections	Inspect periodically all connections on the switchboard main bus and cable connecting lugs to assure good contact, tight joints and clean contact surfaces. Make sure all accessible parts are adequately insulated and mechanically protected from injury.
Fuse Clip Tension	Check the tension on fuse clips each month for clean contact surfaces, pitting and tension. Frequent removal of fuses weakens clip tension. If tension is gone, install new tension clips.
Fuse Size and Temperature	Check fuse size for proper protection to the circuit. Do not parallel links in cartridge fuses; use a heavier circuit and fuse gap. Make sure there is adequate ventilation to dissipate heat generated in panel.
Doors and Locks	Check all panel or switch enclosure doors and locks for easy closing and locking. Unauthorized persons should not have access to panels and switchboards. Make sure all circuits and switches or circuit breakers are properly indexed on panel door to avoid confusion.
Grounding	Check all enclosures and neutral busses for tight connections with good contact to equipment and system grounding conductors.
LIGHTING SYSTEM	
Outlet Location	Check outlet locations and spacing whenever a department is changed or moved. Change them to fit the particular job at hand.
Switch and Electronic Control	Check location of lighting switches and electronic control to see that they are convenient and adequate. Use proper switch for specific lamp loads. Install automatic electronic control wherever practicable.
Fixture Accessibility	Check position of fixtures for maintenance accessibility, especially when departments are moved or rearranged.
Shock and Vibration	Check the shock and vibration conditions in the building. If excessive, shock absorbing sockets and mountings should be installed on the fixtures. Heavy duty lamps can also be used.
Light Quality and Intensity	Check to determine if the quality and intensity of the lighting is of the proper type and amount for the particular task at hand. Use a light-meter to take foot-candle readings of the intensity on the working plane. Compare actual intensities with recommended ones in engineering tables. Check intensity every 15 days to determine loss due to dirt on reflectors, or age of lamps.
Lamp Condition	Check condition of the incandescent and fluorescent lamps. Old lamps give less light and will go out unheralded. Change lamps just before rated life expires. To maintain efficiency on multi-lamp fluorescent units, replace all lamps when one burns out. Keep the others as spares.
Reflector Condition	Check fixtures for condition of reflecting surfaces. Wash reflectors with soap and water according to a regular schedule. The following is suggested: Unit — Conditions — Schedule Direct and Semi-direct fixtures — Very dirty — 7 days Dirty — 15 days Average — 30 days Clean — 60 days Semi-indirect and indirect fixtures — Average — 15 days Clean — 30 days Static electrical changes on plastic fixtures may be eliminated by washing with a solution of glycerine and water or wax and water.
Circuit Voltage	Make periodic voltmeter checks on the lighting circuit voltage to assure lamp operation at rated voltage. Over-voltage operation increases light output but decreases lamp life. Fluorescent lamps will operate efficiently only near rated voltage.
CONTROL EQUIPMENT	
General Inspection	Make a weekly general inspection of all control apparatus to discover any wearing, pitting or symptoms of impending trouble. On continuous duty equipment do this daily.
Proper application	Check control equipment to make sure it is designed for use with the specific motor and equipment connected to it. On grouped-motor circuits, be sure the control is for this type of application. These check-ups are specially important now, when departments and processing are continually being changed or expanded.
Main Contacts Interlock Tips Bearing Lubrication Alignment	These points should be checked carefully at least annually. If the plant is operating under pressure, such as many are today, this should be done monthly. All parts should be thoroughly cleaned and those showing signs of wear should be replaced immediately.

CHECK LIST	WHAT TO DO
Electrical Protection	Check the overload and undervoltage protection of all controls regularly. Be sure that the overload protection is of proper size for the equipment protected. Use control only in original enclosure for which it has been designed and tested by Underwriters. Placing it in other enclosures may affect operation of protective devices and cause trouble. Consider temperatures around control.
Circuit Insulation and Connections	Check circuit connections and conductor insulation frequently for loose contacts and insulation deterioration. Heat, oil and corrosive conditions may cause trouble. Check control circuiting whenever it is moved from one machine or department to another.
Grounding	Check the equipment grounding on all control apparatus frequently for loose or broken connections. Proper grounding is essential to employee safety and to reduce accident and plant shutdown hazards.
MOTORS, A.C., D.C.	
Proper Application	Whenever a department is changed or moved or a machine is relocated or a new drive installed, check the motor to make sure it is designed for that type of service. Be sure motors are of correct size and speed for the job at hand. This also applies to the use of d.c. motors.
Mechanical Points	Check the motor alignment whether it be direct connected through gears or couplings or belt connected to the driven equipment. Misalignment means worn bearings, overheating, reduced airgaps, damaged coils and plenty of trouble. Belt tension should also be checked to assure proper loading of motor and no lost power. These points should be frequently checked since vibration, machinery relocation and operating conditions may alter the original setting.
Operating Conditions	Whenever departments are changed or relocated, check the conditions under which the motor must operate. Check for dust, dirt, fumes, heat, moisture and other adverse operating conditions. Be sure motor is of proper type to use for these locations.
Cleaning	All motors should be throughly cleaned at least every six months. If operating conditions are such that excessive dirt and dust are present, this should be done more frequently. Cleaning should include blowing out windings, cleaning rings, commutators, brushes, poles and air gap spaces.
Bearing Lubrication	Lubrication of all motors should be checked weekly. Oil in sleeve bearings should be completely renewed every six months, or more frequently if necessary. Grease in ball bearings should be renewed at least once a year. Be sure that the correct type of oil and grease are used.
Clearances	Check air gap clearances and bearing tolerances at least once a year and more frequently if motors are operated under excessive loads and running schedules. While doing this, armature bands should be inspected for loose or broken strands. Check brush pressures and positions.
Connections	Armature coil, commutator and line connections should be inspected frequently to prevent looseness due to overheating and vibration.
Voltage	Check motor terminal voltage frequently to assure operation at nameplate rating. Like any other equipment, motors operate at highest efficiency at voltage for which they are designed. Ordinary or recording voltmeters can be used.
Load Amperes	Load tests with clamp-on type or recording ammeters should be made frequently to determine if motor is under- or over-loaded. Motors operating below rated load lower system power factor; overloading causes heating and burnouts.
Temperature	Take operating temperature readings of motors frequently. Use thermometer or thermocouple and don't rely on the sensitivity of the hand to determine the temperature. An overheated motor means trouble and may indicate excessive electrical or mechanical overloads or high ambient temperatures in the vicinity of the equipment.
Insulation Resistance	Insulation resistance readings of the motor windings should be made with a megger at least once a year and more frequently if operating conditions demand. Records should be kept of each reading and the minimum values should never be exceeded.
Speed	Periodic checks on the operating speeds of motors should be made with a hand tachometer or preferably with an electrically operated one. Checks should be made to determine if motor comes up to speed in designated time. If it doesn't, its load might be too heavy or some other trouble might be present. Long periods for coming up to speed mean longer periods of high inrush currents on both the motor and the line.
Grounding	All motors should be properly grounded and the system should be checked periodically for loose or broken connections.

FLOODLIGHTING NIGHT CONSTRUCTION

PLANNED floodlighting aids defense building. The Tulsa bomber assembly plant goes up under 533 projectors on 100-foot towers, permitting 24 hour building schedules. Ingenious wiring methods were used to speed the area-lighting installation.

By D. J. Frandsen
Public Service Co. of Okla.
Tulsa, Okla.



CONTRACTOR LES ALLEN *of the Allen Electric Company beside one of the shop assembled control panels.*

DUE to the urgency of the National Defense Program, floodlighting for construction purposes is being widely used to permit night shift operation on defense projects. The 808-kilowatt installation completed by the Allen Electric Company of Tulsa at the Bomber Assembly Plant site in that city is of particular interest for several reasons.

It is a large job, yet it will be removed when it has served its usefulness and the plant is covered. Unlike many somewhat similar jobs, it is intended to provide lighting from one system and without major change for all phases of construction from site grading to steel erection and covering.

Also, it sets up a new task for the electrical contractor who hopes to successfully handle similar jobs. He must appreciate the need for well ordered speed and have a well developed spirit of cooperation. He must have the ability to estimate costs on short notice for unusual working conditions. For the floodlighting installation must be complete and in full operation before construction starts.

The installation consists of 21 wooden towers, 100 feet high, 6 feet square, similar in appearance and construction to the ordinary hoisting tower frequently seen on multiple story construction projects. Each tower has a transformer room at the 86-foot level and a switch and control room at the 92-foot level. Flooring at the 98-foot level, plus two railings above, provide mounting support for the floodlights.

The arrangement of equipment at various levels was dictated by several factors. The space inside a six-foot square tower is cramped. The stacking of floor above floor avoided the necessity for crowding equipment, made working conditions somewhat safer and segregated the various parts of the electrical work so that, when necessary, two crews could work a tower. The stack arrangement also resulted in a minimum of conductors and permitted a standardized shop assembled panel, thus keeping costs down.

Tower Equipment

Each tower contains a single phase transformer (at the 86 foot level) fed from a 3 phase, 4 wire, 4100 volts tower-supported Y primary. Transformer sizes vary with the floodlighting load of the particular tower involved. The transformer feeds at 120/240 volts through a 200 amp., 3 pole SN, type D safety switch into a 6 pole, 2 fuse, 30 amp. safety switch. These control panels are shop assembled on a 5 ply, $\frac{3}{4}$-in. backboard, taken to the site and hoisted into place.

The 6 pole contactor presents a good example of ingenuity. Equipment shortages and the need for speed were recognized in the specifications, which called simply for contactors of certain characteristics having an even number of poles and capable of breaking the loads involved. Two pole contactors of proper rating were scarce and expensive. Four pole contactors were equally so. The 6 pole assembly used consists of two stock 3 pole motor control contactors mounted in a locally fabricated metal housing and with holding coils interconnected. The breaking capacity is substantially in excess of that required. Poles are paired and not bussed on the load side, each pair serving separately about one-third of the load.

The standard control panel at each tower was designed for maximum loading. On certain towers some of the 2 pole, 30 amp. safety switches are not in service. In general, however, each such switch provides fuse protection for a pair of 1500 watt or 2000 watt floodlights and makes it possible to cut lights in or out of service as construc-

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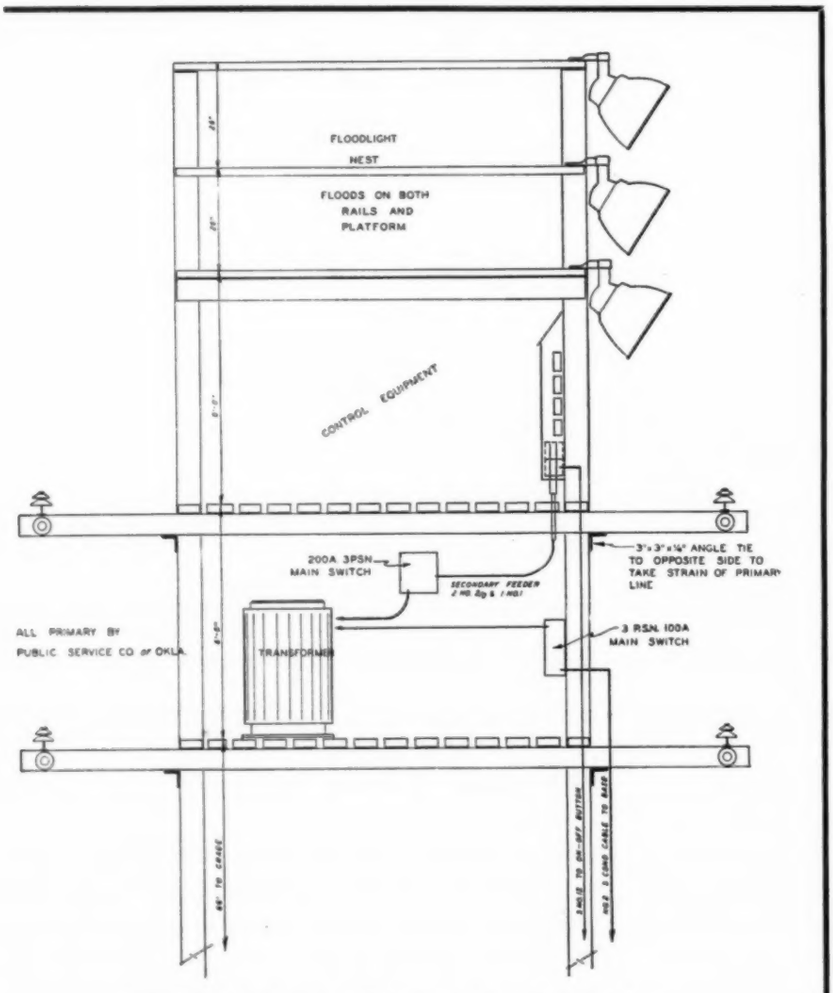
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TOWER LINEUP. *Primary circuit spans are sufficiently high to clear all material handling booms.*



TOWER TOP *assembly, transformers and control equipment are mounted on separate levels.*



COMPLETED TOWER. *The transformer room is between the two cross arm levels—the central equipment room is just above.*

tion requirements dictate. Runs from the panelboard to the floodlights above consist of 3 conductor, No. 12 type S all rubber cords bunched and taped together. Neutrals are carried past the panel switches and connected to a neutral bus which passes solid through the contactor to the main switch.

Operating Control

Routine operating control is from the bottom of each tower by means of a start-stop push button station. These stations energize the control room contactors through runs of 3 conductor No. 12 neutral-wrap concentric service cable carried up and stapled to a tower leg. Also at the bottom of each tower is a 60 amp. 3 pole SN, type C safety switch housed in a wooden box and served through a vertical run of 3 conductor No. 2 neutral wrap concentric service cable from a 100 amp. type D switch mounted in the overhead transformer room. These switches provide for supplementary lighting and power service in the vicinity of each tower footing.

The towers themselves, including all footings, platforms, railings and non-insulated guys were designed and installed by the Manhattan-Long Construction Company, general contractors, to meet the space and spacing requirements set up by the Lighting Service Department of the Public Service Company.

The Distribution Engineering Department of the same company, was re-

[Continued on Page 88]

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Earl Whitehorne, Editor

It is Part of War

Waste walks hand in hand with war. 'Twas so in ancient Greece and Rome. Scandal and inefficiency clogged the plodding feet of armies in Napoleon's era. And in our own wars men have shook their heads at tales of time and money thrown away.

Don't be discouraged by the stories that now pass around, therefore. The urgent needs of war force men into responsibilities in which they are not experienced. These men attempt things that are too big for them, and do them wrong and try again before they blunder through. It's part of the heart-break of every war.

Right now uncertainty about priorities, besets the business man. How badly is the system really working?, he wonders. There is but one thing sure. What is unduly restrictive will be discovered. Mistakes will be corrected. Lessons will be learned. Progress will be made. Already our industrial production is climbing.

Now is the time for patience and clear thinking. It is a time, when every man should put his mind to doing his part in the big job. It is no time for pessimism and complaint.

Misfits in the Market

It comes a shock to us, accustomed to the high standardization of lamp bases, plugs and sockets in this country, to learn that our standard has no place in the world market. For while European lamps may be used here, ours will not fit the sockets abroad. Sam Hibben has just pointed this out, in speaking before the Municipal Utilities convention.

Our airplanes now fly men all over the world. They should certainly be able to buy lamps that fit in any country. They should be able to replace flashlight batteries and bulbs. But in many countries the wandering aviator cannot do so, surprising as it seems.

Still we are far from any voltage standard in the U.S.A. itself. It is better than it used to be, but systems still run anywhere from 110 to 125 volts—and that is too much a variation. And we have not mentioned our too many wire sizes, too many conduit fittings. It is all part of the same thing.

In this war time, this duplication of stock means waste all along the line—in materials, labor and expense. It cannot be excused. The electrical industry should face the whole problem and clean it up as a job to be done now—We should do it for immediate savings and for post-war foreign trade.

Post Mortems Are Dangerous

More local contractor clubs are wrecked in the meeting room than in the market place. Starting off with high hopes and high principles, some of them degenerate into weekly verbal brawls over competitive price policies of individual members.

Backs are up and tempers rising, then the inevitable tableau—"Before that guy gets another job, I'll take it for nothing." In the heat of personal argument, policies are established that no sensible man would consider for two minutes in his ordinary business routine.

Some organizations have faced the fact that a price post mortem is a sterile and dangerous subject for open discussion. The chairman is authorized to rule such discussion out of order. And this is a good plan.

Housing and Wiring

Some interesting facts on the trend of housing, as it relates to wiring were rounded up by A. E. Schanuel of the National Adequate Wiring Bureau at the recent convention of the illuminating Engineering Society in Atlanta. For example:

In the three year period of 1938-40, new homes connected to electric lines totaled 1,350,000.

This year 650,000 new homes are expected.

In 1933 about one out of three customers were living in houses less than ten years old.

From 1933 to '38 average kwhr. consumption jumped 40 per cent.

In the 20's home financing was based on 40 per cent loan and a three year mortgage. Today houses sell on a 90 per cent loan with monthly payments from 15 to 25 years.

During the depression period, electric labor saving appliances were sold in great numbers but wiring was not given much attention. The standard of adequacy advanced but little. So we stand now facing the fact that we are letting this great house building movement roll ahead with almost no guidance as to wiring.

We still believe that this is a job for electrical contractors to handle—but not individually. It needs a jointly owned Rewiring Corporation in every city, organized for mass production and able to sell this market in a large scale operation. There is a great market waiting and every spectacular housing project that goes up should be bearing witness to the value and appeal of full comfort wiring.

Not Always Justified

Complaints from customers of electrical contractors often land in the office of local associations or leagues. Though these organizations are rarely equipped or authorized to act they are often helpful as a cool third party.

An unusual number of such com-

plaints recently come from owners who hired a cheap architect concerned only with price. He tried to write his own specifications after the contract was let. He points to custom or general usage and says. "Even if it isn't in the specifications, you ought to know that's the way we want it."

The best answer is a patient reminder. If the contractor had anticipated these wants in his bid he would not have the job.

Because It Is Needed

The weakness of the residential wiring business lies in precisely the fields where cooperative effort could give strength. A good house wiring contractor need bow to no man in the execution of his work. Some indeed are amazingly adept and skilled.

But enlightened salesmanship, management, advertising, control of costs, are all functions difficult for individuals. They are inherently easy for soundly built organizations.

And further, a strong residential wiring concern might find a way to sell rewiring in old homes. Here is a job which will load this industry for ten years when it starts.

Lamp Profits Return

A lot of money is going to be made in the next few years on fluorescent tube renewals. It is the electrical contractor's meat, if he wants it. And we think he does.

Lighting has always been the bone and sinew of the electrical business. It accounts for the bulk of wiring. It produces the most load. And for years lamp sales brought important profits to the contractor. Then the lamp people spoiled the party by putting incandescent bulbs on sale in every drug and hardware store. Even small commercial and industrial users now buy them there and the contractor man makes no effort to push them.

But the new tubes are different. They can't be sold like bananas. The customer wants advice and the chain store clerk can't give it. Only the electrical man can tell the buyer what he needs and why.

A recent survey shows that electrical contractors are selling fluorescent lighting on a sound basis, with an average objective of 42 foot-candles. A large volume of tubes is being sold separate from fixtures. Renewals are building up into important money. It remains for every contractor to establish himself as the tube renewal source for all equipment he installs. Lamp sales can once more become good substantial business.

Back Talk

Home Lighting

To the Editor—"I have read your article 'A Look Ahead at Home Lighting' with real interest.

"Certainly anything that can be said to the contracting audience to inspire a more aggressive and progressive sales effort motivated by the heightened sights of the profit and service possibilities of more glamorous and skillful lighting for the home is altogether constructive and valuable. As you so effectively say, the present attitude of 'too great expense' on the part of most electrical men is one of the baffling and stubborn obstacles to faster progress.

"However, can we overlook the fact that the average contractor must key his sales effort more directly to the quick-sale, mass market and to customer demand, rather than to the smaller, more specialized market that requires educational development? Would it not, therefore, perhaps have been more encouraging and constructive in your article to have suggested a more hopeful picture of the progressively changing demand for better lighting and thus stir them to capitalize on this growing demand to sell the higher standards of wiring and lighting now recommended, than to have implied that the contractor must strike out with advanced ideas and carry the educational and sales burden in a market that's 'in the doldrums—sick and sad'. The fact is, won't you agree that more has been done in the last seven years than ever before through the individual home advisor contact method (some 10 million such calls have been made —not to mention the broader advertising, editorial, direct mail and lecture publicity) to waken the public to the benefits of good lighting and thus to stimulate interest and query.

"It would seem to me then, there is greatest need at this time to give specific suggestions toward understanding this trend and cooperating with it to build increased sales from these beginnings. Especially so, since the numbers of prospective customers involved is so much greater than those who could undertake the more glamorous and novel fluorescent built-in ideas you suggest.

"I admire the point you make on bathroom expenditures and I believe if the minority high income group buys the glamorous new lighting, it will, of course, tend to raise the lighting expenditures of the majority low income group—but there are limits beyond which they cannot logically go. With present fluorescent equipment costs, I feel confident that creditable 'built-in fluorescent lighting for the major rooms' plus high standard incandescent lighting for the remainder of the house would far exceed these limits for houses in the cost class which prevails."

E. W. Commery
General Electric Co.
Nela Park

Undoubtedly true—an eminently practical point of view. Yet who knows the future? Compare the comfort now built into the modest home with the bare house of thirty years ago and what can you foretell? We see progress coming in home lighting that is unthinkable right now because people don't want it. We do not say to sit and wait for these new ideals. But while we sell what we have now in fixtures, let's look ahead and work towards these better standards that we can develop if we will work for them.

Home Lighting

To the Editor—For Heaven's sake, where did you get the idea that home lighting is now in the doldrums? To be sure, the unrealized market is as vast as it is alluring—and electrical contractors, if they will only stir their stumps, can cash in on it, but don't you know that there is more activity on home lighting today than ever before in the history of the lighting industry?

"And, as for the Specification-Certification program of the American Lighting Equipment Association nearly three score designs have been certified by Electrical Testing Laboratories and, were it not for the extreme shortage of raw materials, more than twice that number would have been certified as well as design-approved.

"What you say about fluorescent lighting for the home is true as far as it goes. But let's temper our enthusiasm with realism. Fluorescent lighting for the home is developed, but there are still some wrinkles to be ironed out before it can be promoted on a mass scale. So, while it is perfectly in order to paint a glowing picture of the future, we should at the same time not overlook today's realities."

J. W. Milford
American Lighting Equipment Association, Inc.
New York, N. Y.

Fine! Fine! Jack Milford. Nobody is gladder than we are. It is all progress—new thought and action in the right direction. In our article on home lighting in the August issue we were looking into the future. We said so. This does not decry anything good that is being done now. But we still see these important changes coming before home fixtures become consciously important to the American people.

Planning for Peace

To the Editor—"With respect to your editorial 'Perils Ahead' in the current issue of *Electrical Contracting* you have hit the bell again. Despite all the present difficulties we are faced with due to the impact of the huge defense program it is not any too early for individual concerns and industry groups to plan ahead.

"Your suggestions are good and should start our industry thinking ahead to meet this problem."

W. J. Wheeler, President
The Maintenance Co.
New York, N. Y.

Thank you, Bill, and you can help start it. Most men feel too busy to think and work that far ahead but it is an urgent need if we are to be ready for the next turn of the wheel.

The Morning After

To the Editor—"Your editorial in September issue *'Electrical Contracting'* is very constructive. It certainly is not too soon to study what to do in 'the morning after', which is bound to come.

"I think you have correctly indicated a very wide market—tremendous opportunity. But to really reach that in a depressed period will require new methods of attack, and new philosophy. The unserved market then will be those jobs which customers could not afford to pay for in good times. These will require new and simpler wiring methods at lower unit costs, and with a philosophy of narrower profit margin by the seller who will thus attain the total profits necessary for his existence by increasing his volume.

"If sellers try to meet depression conditions with old methods at boom price levels they simply won't get the business! The buyer will go without!"

R. D. Cutler, Vice President
The Hartford Electric Light Co.
Hartford, Conn.

Right as rain. For when war work stops, it will require large volume production to maintain employment and prosperity. That calls for large volume selling and that means highly organized efficiencies and economies in wiring, as in all else, to give low costs and the mass market. That's why we must be ready with sound plans for the electrical industry.

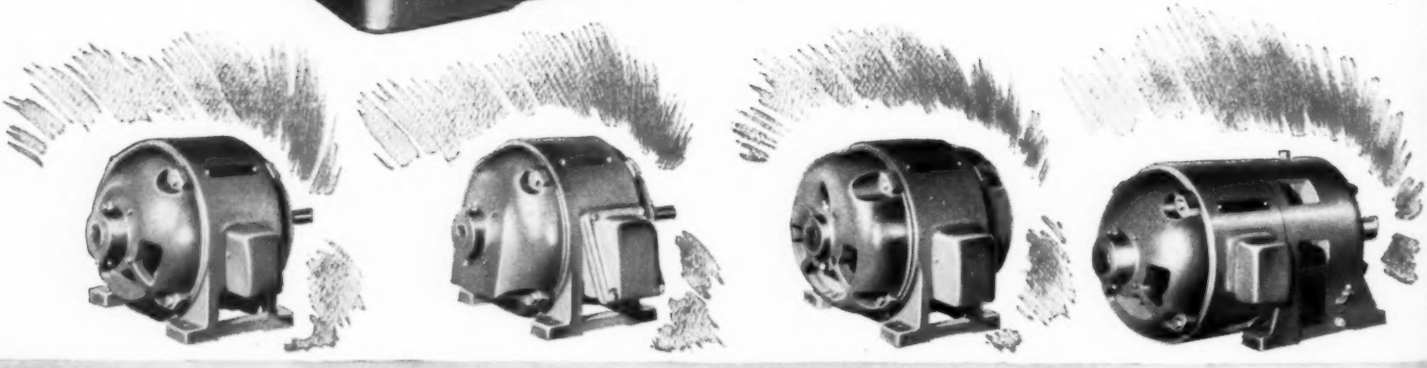
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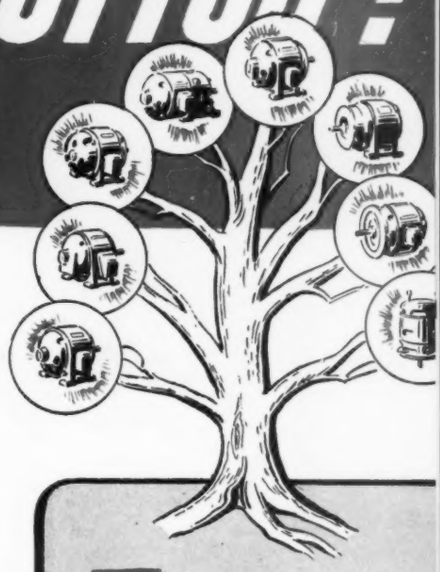
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For close-coupled attachment to machine tools, compressors, pumps, etc. Motor bolted from driven machine. A few standard mounting dimensions apply to many motor ratings.

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For close-coupled attachment, or direct bolting to driven machine. Mounting dimensions are standard, but larger than those of face-type end shield.

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For general-purpose fan, pump, and machine drives in vertical position. Openings protected and bearings designed for vertical operation. Both polyphase and capacitor-motors available with variety of bases.

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Extra Protection
AGAINST ELECTRICAL BREAKDOWN
Stator windings of Formex wire, "armored" by synthetic resins against moisture, heat, oil, and abrasion.

Extra Protection
AGAINST OPERATING WEAR AND TEAR
New sleeve-bearing design and improved ball-bearing mounting lengthen life.

In addition, you'll find the modifications to meet special requirements are soundly engineered to give you space-saving, time-saving, and money-saving advantages all down the line. Consult your G-E representative for Tri-Clad horsepower ratings now available.

GENERAL ELECTRIC

750-90-8058

FA BUSDUCT in strong 20-foot sections!



In actual practice, the only weight borne by the Busduct is its own. Yet, under the weight of these two heavy men — approximately 500 pounds — the deflection in this 20-foot section is scarcely noticeable. This indicates the exceptional strength built into the design of FA Busduct.

This standard 10-foot section of Plug-in FA Busduct shows the nine plug-in outlets, and, from left to right: FA Shutlbrak Switch Plugin; FA Klampswfuz Plugin (open), and FA Klampswfuz Plugin (closed). 20-foot sections have 18 outlets.

FA Busduct is made regularly in standard 10-foot sections. But here was an unusual situation, because busduct supports in the plant were possible only at 20-foot intervals. This presented a special engineering problem of producing busduct in *20-foot sections* which would have *minimum deflection* under these supporting conditions. The problem was met by FA Engineering and Production Departments — and the specially designed equipment shipped in record time to a vital defense plant.

FA Busduct is the modern compact, flexible and convenient method of distribution for power and light. It is ideal when changes are necessary in machine layout. Time lost in placing or relocating machines is reduced to the minimum. Simply "move the machine — plug in — go!"

While both Feeder and Plugin types are made in standard 10-foot sections, variations are possible to meet special conditions, as above. Each standard section of the Plugin type is arranged with nine plug-in outlets on 12-inch centers. Suitable elbows, tees, end boxes, intermediate feed-in and feed-out boxes, are supplied to fit required space or position — whether on wall or ceiling.

The copper busbars are contained in enclosures of steel or aluminum. They are rigidly supported at 30-inch intervals by specially designed insulators that insure proper spacing — to meet the requirements of the National Electrical Code. Contact surfaces of connecting bars are silver-plated, to insure low resistance joints. Designed for 2, 3 and 4-wire feeder systems; 250 volt DC, 575 volt AC, maximum. Plugin type capacities: 125 to 1,000 amps.; Feeder type, from 250 amps. and up.

FA Busduct is practically immune to deterioration. It may be taken down and installed in new positions, in the same or different buildings, as need may require. Extensions may be made readily to existing installations. Moderate first cost is combined with low up-keep.

FA Sales-Engineers Can Help Manufacturers, Architects, Engineers and Contractors with Their Distribution Problems

Their long experience and training are at your service — without obligation. Write for name and address of the one nearest you. Also, for Bulletin 61, which contains complete description, applications and detail drawings for FA Busduct . . . Frank Adam Electric Company, St. Louis, Mo.

EST. 1891 — THE SIGN OF A BETTER JOB

Frank FA Adam

1891 FIFTY YEARS SERVICE 1941

FRANK ADAM ELECTRIC CO. ST. LOUIS, MO. U.S.A.

MODERN LIGHTING

What To Use In Lighting

A review of available equipment, both fluorescent and incandescent, classified as to characteristics and performance to guide and simplify selection.

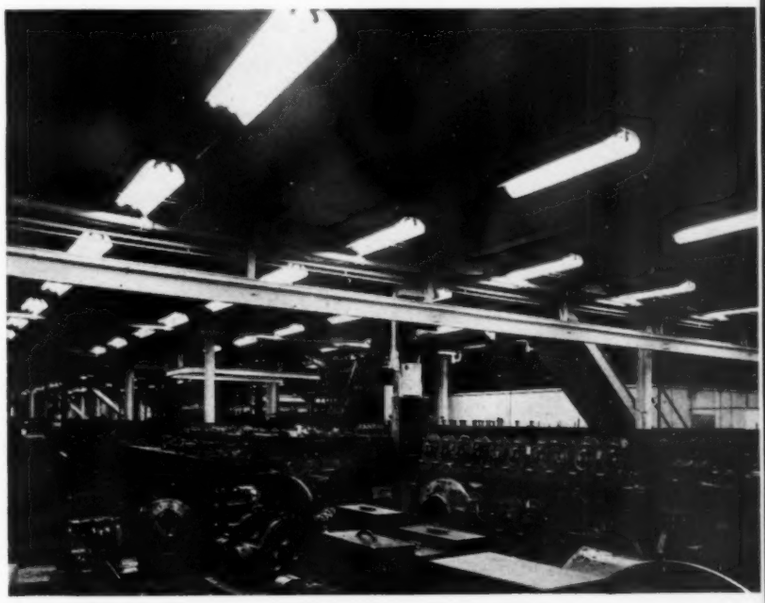
WITH the development of fluorescent lighting equipment, the problem of what to use for lighting has become much more complicated. The electrical contractor and the electrical engineer of the large industrial plant are both groping around right now for the answer.

Perhaps the job in hand can use fluorescent lighting to advantage. Perhaps incandescent equipment will be best. Perhaps it should be a combination of both. In any case, the next step is to select the size and type of lamp, the type and size of reflector and to decide then where and how to install them—how high, how close, how many. And the selection and the application must be right—or else.

Starting from here you turn to the manufacturers' catalogs—and tear your hair. For there are so many varieties of fluorescent units, so many kinds of incandescent reflectors and housings and each one says "Use me! I am best!" The result is a baffled mind and too often a decision based on the necessity for action—a look at the picture, a hurried check of the data and more confusion. But a selection has to be made and frequently it is made at last on the "I-guess-this-will-do" basis.

And yet the matter is not as difficult as it appears.

NEVER A BLACKOUT *when the sun sets over industrial plants today. Highly engineered artificial lighting systems rival daylight illumination and facilitate the all-out defense effort.*



Study it awhile and out of the multiplicity of conflicting appeals and claims of the offerings of different manufacturers, order begins to emerge. For after all, these many lighting units are designed to serve a definitely limited number of lighting situations. Therefore, they can be grouped in classes that are comparable because they are logically used under comparable conditions. And so, if you pursue the analysis you finally discover that there are just so many types of fluorescent units for industrial lighting and just so many types for commercial lighting, and the varied designs of all the manufacturers will fall within these groups. And so it is with incandescent equipment.

With this fact in mind, the whole process of selecting lighting equipment is simplified. With certain conditions to meet, a certain class of equipment is indicated. Within that class, further selection from among competitive equipment will provide variety both in appearance and in performance. Choosing the best lighting units, therefore, becomes a matter of seeking out the best types and sizes for the immediate need in the various sections of the building to be lighted, the units that will contribute most to aid the work that will be done or best provide the decorative or general illumination that is desired. And by the process of elimination, selection is made not only easy, but what is far more important, it is made accurate and sure.

The trouble has been, of course, that there has been no place where these classes of equipment have been classified for ready reference and quick analysis. It has been no one manufacturer's job. And it involves the kind of a survey and digest that the individual seldom undertakes because of the labor and time it takes. With the cooperation of a number of lighting experts, therefore, we have worked out the following breakdown of lighting equipment now available and present it as a guide and tool for practical use. It sets up clearly, the several classes of equipment for both fluorescent and incandescent lighting. It compares and classifies them both as to characteristics and performance—which is the key to application. In a word, it shows what to use for lighting, how to select what you need for almost any job among the bewildering diversity of equipment which the manufacturers now offer for the lighting of commercial and industrial interiors. And at the same time, we give brief comment on protective lighting possibilities.

With each class of units, for each kind of service, a tabulation of data has been developed to indicate the characteristics, performance and usefulness of each basic type of lighting equipment. In it the safe range of application is indicated so that job conditions can be checked against equipment and a sound selection can be made.



SABOTEUR'S DILEMMA. *Well lighted plant yards, storage areas and building outlines discourage attempts at sabotage.*



SEA OF LIGHT. *Drafting rooms need plenty of good quality illumination to eliminate end-of-day and overtime fatigue. A slip-up here may mean disasterous delays.*

FLUORESCENT
Industrial Units

A WIDE VARIETY of fluorescent lighting equipment has been designed for industrial service. We find, by analysis, however, that the many designs may be reasonably classified in five groups. In each group are units intended for a definite range of application, primarily in factory space. Here characteristics of the work and of the plant layout suggest a similarity in lighting requirements. The five classifications are as follows:

GROUP A . . . . The RLM and Open-End Units with porcelain enamel on steel reflectors for diffuse general illumination in ordinary industrial interiors.

GROUP B . . . . The RF Units with special, non-stroboscopic, fluorescent lamps in wide, open, porcelain enamel on steel, reflectors for general lighting in industrial interiors.

GROUP C . . . . The Continuous Troffer for Suspension Mounting, in reality an RLM type unit designed for end-to-end mounting. It provides high levels of general illumination in large industrial areas or comfortable high level bench lighting.

GROUP D . . . . The Continuous Troffer for Flush Mounting is designed specifically for installation in acoustic tile or plaster ceilings. This suggests its use for high level illumination in areas where conditions are controlled.

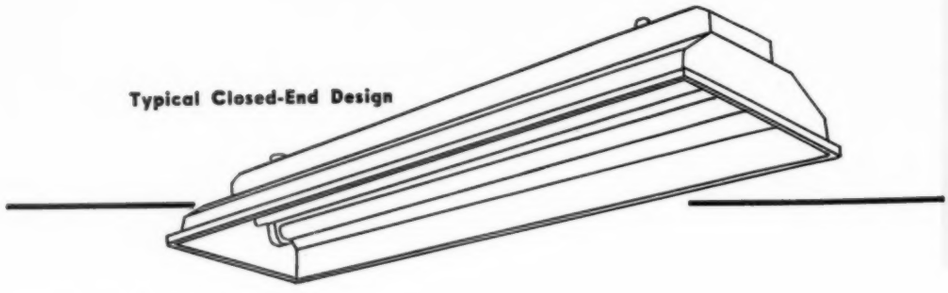
GROUP E . . . . Supplementary Fixtures for fluorescent lamps with diffuse or concentrating reflectors. These are useful in lighting small areas to extremely high levels above 100 foot-candles without heat discomfort.

● With this variety of equipment available, it is apparent that the purchasers must select the group with the characteristics that meet his requirements and then compare the offerings of the manufacturers.

Fluorescent Industrial Units

Group A . . . RLM and OPEN-END UNITS

Typical Closed-End Design

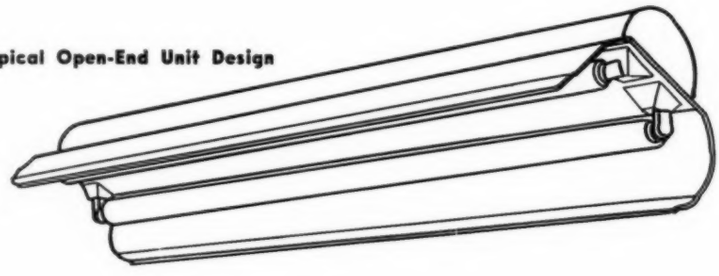


Typical Distribution

THE RLM type fixture accommodates two or three 40 watt, or two 100 watt standard fluorescent lamps in a closed end, open trough type, porcelain enameled reflector. To meet the rigid RLM (Reflector and Lamp Manufacturers) specifications, the reflector cut-off, perpendicular to the lamps, must be at least 17½° from the horizontal and the reflector efficiency must be at least 78 per cent. Because of its early acceptance and wide use in the industrial lighting field, this type has developed rapidly and present models already include many practical improvements in design and construction.

Open-end units, which are similar in design and performance to the RLM unit, are also available.

Typical Open-End Unit Design



RECOMMENDED APPLICATIONS

For general lighting for almost every industrial area with levels up to 50 foot-candles. For local lighting for high levels in conjunction with any general lighting system.

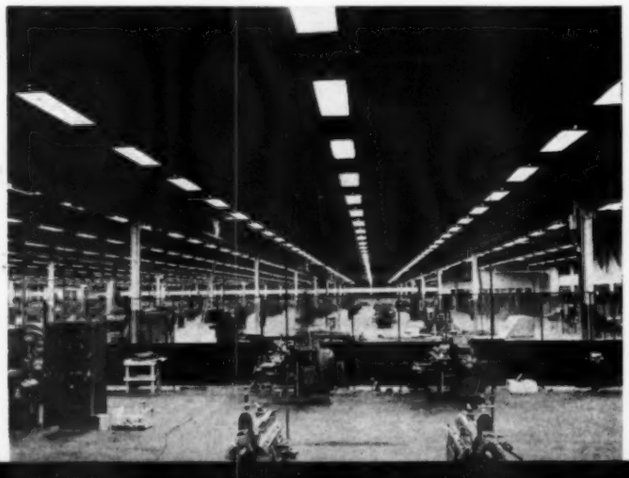
PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM*	AVERAGE ROOM**	2–40 Watt***	3–40 Watt***	2–100 Watt***
144	121	15	21	30
64	50	35	50	70
49	35	45	71	90

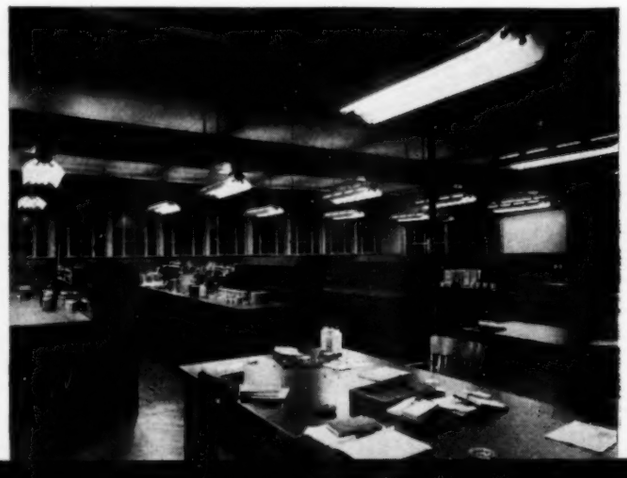
*Width 10 times mounting height. **Width 4 times mounting height.
*** 3500° White Lamps

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

BLANKET OF LIGHT *over this large industrial area is of 35 foot-candle intensity. Two-lamp, 100-watt, closed-end fluorescent units, 15-ft. above the floor, are mounted on 10-ft. by 13-ft., 4-in spacing.*



GOOD LABORATORY *lighting is essential for close observance of chemical reactions. Here, open-end, two-lamp, 40-watt fluorescent units provide an intensity of 37 foot-candles on the table tops.*







The SUPER TWO-HUNDRED
For Two 100-watt lamps



The TWO-FORTY
For Two 40-watt lamps



The THREE-FORTY
For Three 40-watt lamps

NOTE: All of these fixtures are available wired or unwired, with 6-ft. cord and plug, for pipe or chain suspension.



DayBrite Rivals Daylight

In offices, factories, plants — wherever light is essential to getting things done — recommend and install Day-Brite Industrial Fixtures! Here are some of the many reasons why:

First: You are assured of prompt shipments, because the modern Day-Brite plant is geared to high-speed, quantity production every step of the way.

Second: You are always certain of highest quality standards, in both product and performance—because every Day-Brite Fixture is designed and engineered to meet all the requirements of effective illumination . . . "DAY-BRITE RIVALS DAYLIGHT."

Third: You gain speed on the job—every Contractor-Dealer knows that Day-Brite Fixtures are mechanically designed to save installation time and costs.

ESPECIALLY IMPORTANT NOW

Day-Brite's Engineering Service

Now, more than ever, Day-Brite's "OVER-ALL" Engineering Service *saves time* — from estimating the job to its final inspection! At no cost, Day-Brite Engineers will analyze the requirements of each individual installation and make correct recommendations for proper fixture placement, illumination intensity, ultimate light value, and other vital factors . . . It's a service that costs you nothing and helps you much . . . Consult Day-Brite Engineers! Representatives in principal cities.

THE Complete Line of Fluorescent Lighting Fixtures

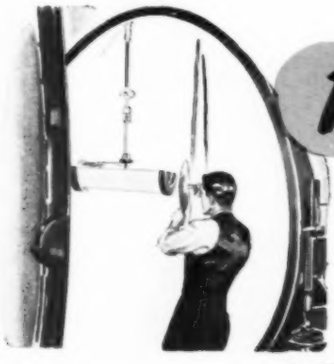
NATIONALLY DISTRIBUTED THROUGH ALL LEADING ELECTRICAL SUPPLY HOUSES

Here's your key to greater Fluorescent

. . THE FLEUR·O·LIER

Sell fixtures backed by

FLEUR-O-LIER'S NEW 4-POINT PROGRAM



TESTED Famous, impartial Electrical Testing Laboratories put Fleur-O-Lier fixtures through exhaustive tests which include checking such vital points as flicker correction, durability and safety, ease of maintenance, dependable ballasts and starters, efficient lighting performance, high-power factor (over 85%). These rigid tests protect *you* . . . give your customers definite assurance on features they want.



CERTIFIED Based on these tests, Electrical Testing Laboratories gives the Fleur-O-Lier Manufacturer the right to affix the label of certification to all fixtures identical to the sample submitted. This label is your assurance that the fixture wearing it meets the 50 rigid specifications set up by MAZDA lamp manufacturers for better light and better service. You can buy or sell Certified FLEUR-O-LIERS with confidence!



GUARANTEED Certified FLEUR-O-LIERS are guaranteed by their manufacturers to be free from any defects of material, workmanship and assembly for a period of 90 days. Note the complete guarantee shown here with which every Fleur-O-Lier Manufacturer complies.

Lighting SALES and PROFITS . .

LABEL



4 ADVERTISED

Over 25,000,000 FLEUR-O-LIER advertising messages makes the Fleur-O-Lier program the largest ever put behind fluorescent lighting fixtures in any three months' schedule. Headed by SATURDAY EVENING POST, TIME, NEWSWEEK, NATION'S BUSINESS, BUSINESS WEEK and UNITED STATES NEWS, this gigantic consumer, trade and business magazine schedule hammers home the certified FLEUR-O-LIER message to thousands of stores, offices and factories all over the United States. Use the label to build your sales now!

The Fluorescent Futurama, *an amazing exhibition of the latest in certified lighting fixtures will be shown this fall in: Albany, Boston, Hartford, Allentown, Wilkes-Barre, Indianapolis, Omaha, Miami, Atlanta, Birmingham. Tentatively planned are: Memphis, New Orleans, Houston, Dallas. Check with your local electric service company for show dates and complete information.*

Get this new book *FREE*

Just reprinted, it tells all about Fleur-O-Lier fixtures and describes in detail the 50 standards to which they are built—and shows how many of the tests are made. Your request will be filled at once and will also include a list of the manufacturers now making Certified Fleur-O-Lier equipment.



FLEUR-O-LIERS

CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

TEAR OUT AND MAIL

FLEUR-O-LIER MANUFACTURERS
2122-10 Keith Bldg., Cleveland, Ohio

Please send me FREE new booklet "50 Standards for Satisfaction," together with list of Fleur-O-Lier manufacturers.

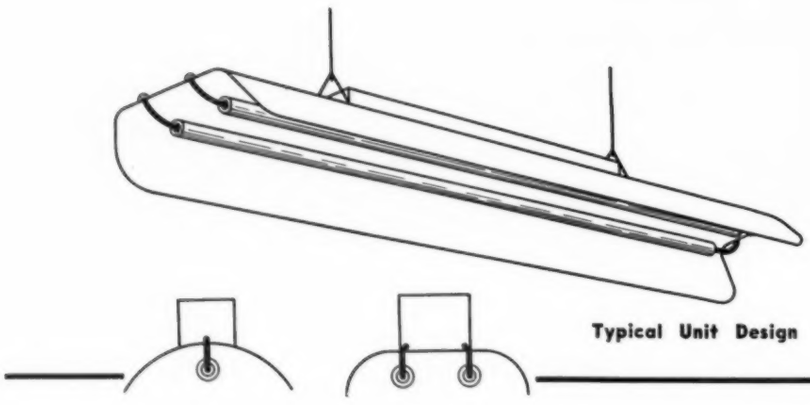
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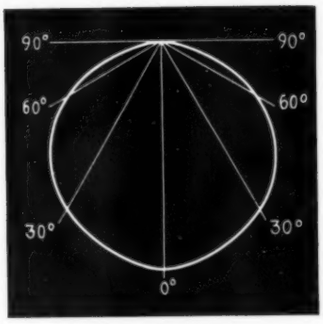
City _____ State _____

Fluorescent Industrial Units

Group B . . . THE R. F. UNIT



Typical Unit Design



Typical Unit Design

TYPE R.F. fixtures accommodate either one or two R.F. (rectified fluorescent) lamps, supporting them singly or parallel to each other by means of special lamp holders in trough shaped, open or closed end porcelain enameled reflectors. The R.F. lamp, which with the addition of a fluorescent coating developed from the low pressure mercury arc lamp, operates on rectified alternating current supplied by a special ballast. The 57½-in. lamps are 1½-in. in diameter, have 3000 hour life, higher brightness, and less stroboscopic effect than standard fluorescent lamps. The power factor is about 83 percent.

The 85-watt R.F. lamp is available in two colors—blue-white and "industrial white." Both lamps are interchangeable in any of the standard R.F. fluorescent luminaires.

RECOMMENDED APPLICATIONS

For general lighting wherever the characteristic blue-white color and imperceptible flicker are advantageous. In high bays or elsewhere when local conditions make for difficult maintenance. Also where long life, high lumen lamps and lower maintenance costs are desirable.

PERFORMANCE CHART—Characteristic of the Group†

FLOOR AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL	
LARGE ROOM*	AVERAGE ROOM**	1–85 Watt***	2–85 Watt***
170	158	12	25
106	100	20	40
71	66	30	60

*Width 10 times mounting height. **Width 4 times mounting height.
***Either Blue-White or Industrial White.

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

CRITICAL SEEING *tasks in this weaving plant are facilitated by 30 foot-candles of light from 85 watt R.F. units.*



MACHINE TOOL *industries need good light. Here, two-lamp R.F. units produce a 40 foot-candle blanket of illumination.*



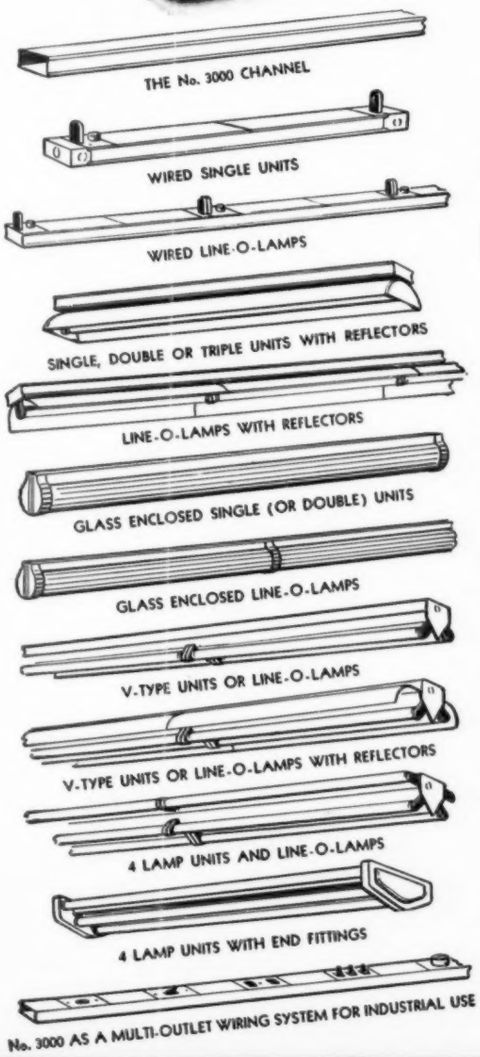
ONE BASIC SYSTEM

WIREMOLD "3000"



Equips you...

to handle a majority of modern FLUORESCENT LIGHTING INSTALLATIONS



A complete, flexible, thoroughly engineered Lighting and Wiring System for Fluorescent.

This, we believe, is the first truly universal SYSTEM of interrelated lighting and wiring equipment designed to cover the great majority of all fluorescent lighting requirements.

Most electrical contractors are already thoroughly familiar with the Standard Wiremold No. 3000 Channel and fittings. Starting with this Channel, as shown in the illustrations, reflectors, enclosures and other accessories permit practically unlimited scope in designing complete Fluorescent lighting layouts exactly fitted to individual needs.

We shall be glad to send you further information on any or all of the interesting applications of the Wiremold "3000 System".

Our Engineering Service is available for your assistance in laying out and suggesting proper installations. Send sketch with detailed information of areas to be lighted.

THE WIREMOLD COMPANY, HARTFORD, CONN.

BETTER LIGHTING *must start with* BETTER WIRING

MAZDA F LAMPS MEAN MORE BUSINESS FOR YOU!



G-E ADVERTISING IS TELLING YOUR CUSTOMERS the plain facts about fluorescent and how to be sure of getting a good installation. It urges them to:

1. Get competent advice—either from your local G-E distributor or the local electric service company.
2. Get certified fixtures for balanced performance—either Fleur-O-Lier or RLM fixtures.
3. Get a wide enough choice of fixtures to be sure of a fixture fitted to the job.
4. Get G-E MAZDA F lamps—all the advantages of MAZDA Research.

G-E MAZDA LAMPS



1. PUBLIC PREFERENCE FOR G-E—When you sell fluorescent lighting with G-E MAZDA F lamps you are simply following public preference for products that carry the famous mark of G-E quality. Over forty years of national advertising have made General Electric one of the world's best known names, a name that means research leadership.

2. MORE LIGHT AT LESS COST—Following G.E.'s policy of giving the customer more and more light for his money, G-E MAZDA F lamps have been steadily improved (as much as 40%) and reduced in price (as much as 52%) since MAZDA Research introduced the first practical fluorescent lamp in 1938.

3. MAZDA RESEARCH IMPROVEMENTS—G-E MAZDA F lamps carry all the prestige and the development background of MAZDA Research Laboratories. That means that the very latest improvements coming from MAZDA research are immediately available in G-E MAZDA F lamps . . . another important advantage that makes these lamps easier to sell.

4. BIG NATIONAL ADVERTISING—There are more than 90,000,000 ad impressions this year—in such leading magazines as the *Saturday Evening Post, Collier's, Time, Newsweek,* and over 20 other business publications. All of them tell your customers of the advantages G-E Fluorescent lighting offers. That makes G-E MAZDA F lamps easier to sell.

5. WIDE CHOICE OF FIXTURES—G.E. does not make fixtures for MAZDA F lamps but cooperates with many fixture manufacturers. For best lighting service, we recommend fixtures certified by Electrical Testing Laboratories, such as Fleur-O-Liers or RLM fixtures.

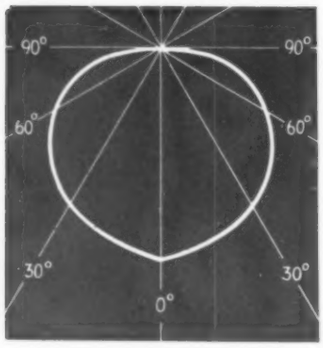
6. G-E ENGINEERING SERVICE—Fluorescent produces remarkable lighting results *when it is properly installed.* If you sell G-E MAZDA F lamps, you can draw on all of the engineering resources and knowledge of General Electric to assure the best possible job for your customer. G-E lamp engineers at Nela Park and in the field will work with you toward that end.

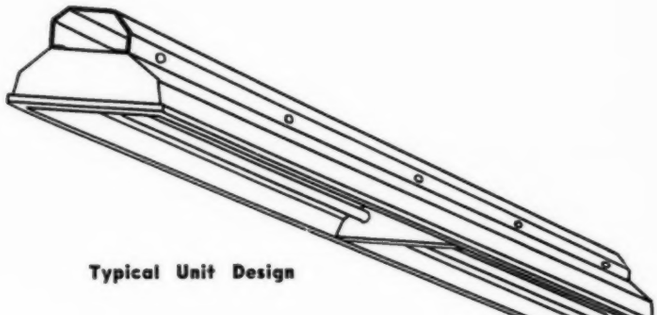
GENERAL ELECTRIC MAZDA

Fluorescent Industrial Units

Group C . . . CONTINUOUS TROFFER

Typical Distribution





Typical Unit Design

THE continuous troffer type fixtures for suspension mounting may accommodate one, two, or three 40 watt, or two 100 watt fluorescent lamps. Two designs are familiar. There are complete channel and reflector sections for two or three lamps with provision for joining to similar sections at each end. There are double length channel sections for four or six lamps, with provision for end joining and individually removable open or closed end porcelain enamel reflectors. This is a natural development from the RLM type over which it provides economies in wiring, acting as its own wireway. There are definite advances in mounting methods, such as the use of carrier cable which simplifies maintenance.

A two-lamp installation may be made with the three-lamp fixture providing for added future capacity.

RECOMMENDED APPLICATIONS

For general high level industrial lighting at 35 to 100 foot-candles for 8-ft. to 50-ft. mounting heights in large areas. For high level local lighting over long benches, inspection tables or production lines.

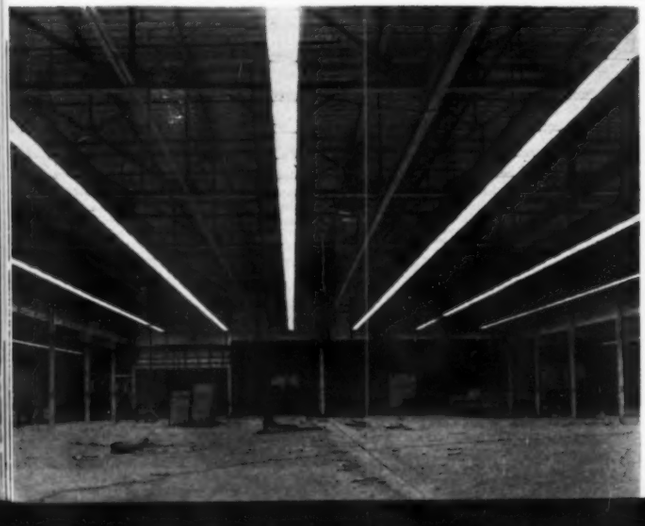
PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM*	AVERAGE ROOM**	2–40 Watt***	3–40 Watt***	2–100 Watt***
64	50	35	50	70
36	30	60	95	120
25	18	100	142	20

*Width 10 times mounting height. **Width 4 times mounting height.
*** 3500° White Lamps

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

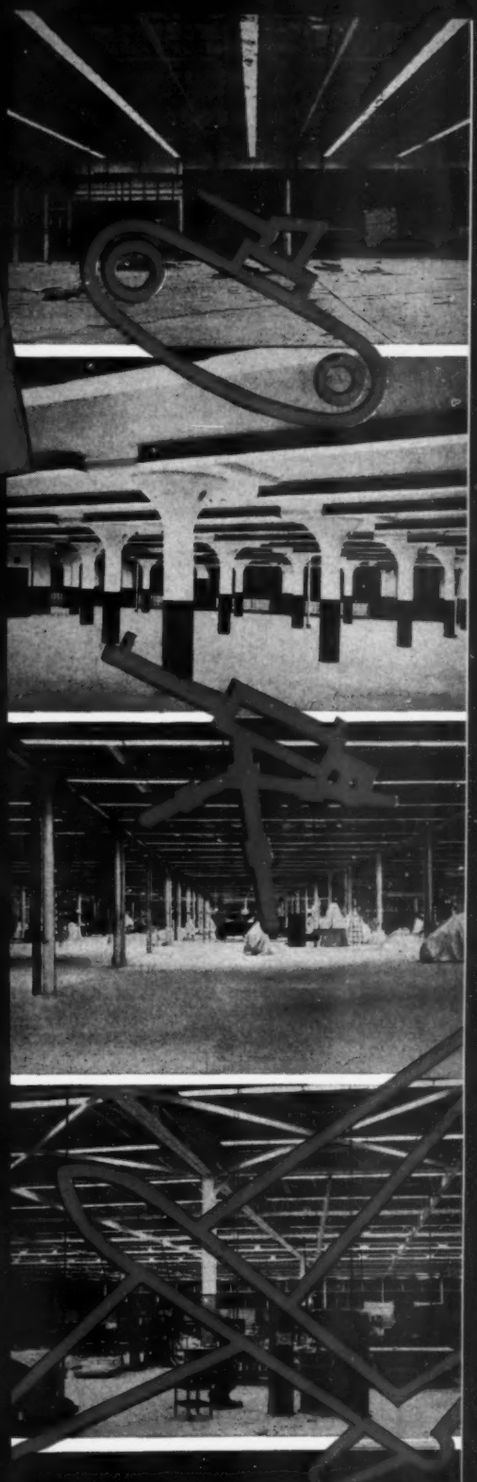
LINES OF LIGHT *produced by end-to-end mounting of three-lamp RLM fluorescent units illuminate this aircraft plant.*



CONTINUOUS TROFFER *of daylight fluorescent lamps, floods this cigar grading table with 38 foot-candles of light.*



MILLER LIGHTING for Defense



MORE THAN 100 MILES of IVANHOE "50 & 100 FOOT CANDLERS" are today speeding defense by providing better working light — in armories, arsenals, airplane and parts plants, in the factories of direct defense suppliers. Every single feature of this *guaranteed* and *proven* fluorescent lighting system makes direct, immediate contribution to the defense effort.

★ ***HIGHER ILLUMINATION***—50 to 100 foot candles—for faster, better production —greater worker efficiency.

★ ***30 TO 50% LOWER INSTALLATION COSTS***—Fixtures contain up to 80% of necessary conduit—makes defense dollars go further.

★ ***FASTER INSTALLATION***—Steps up building schedules — plants get into production quicker.

★ ***UNIFORM LIGHT DISTRIBUTION***—Production equipment can be moved at any time without necessity for changing lighting.

★ ***SIMPLIFIED MAINTENANCE***—Easy to clean, removable porcelain-enameled reflectors —saves valuable man-hours for production.

★ ***ALLOWANCE FOR FUTURE LIGHTING NEEDS***—Illumination increases up to 45% practical without new fixtures—low obsolescence factor.

With the need for night work growing still greater . . . with the heat on for faster and faster delivery of defense goods, IVANHOE "50 & 100 FOOT CANDLERS" become more than ever valuable defense weapons. If you, too, are serving for defense, perhaps we can help you.

The Miller Company, now serving for defense, stands ready to serve still further.

MILLER DEFENSE INSTALLATIONS

MILLER-IVANHOE "50 & 100 FOOT CANDLER" installations represent a "roll call" of the many:

Springfield Armory
Frankford Arsenal
Curtiss-Wright Corp.
Grumman Aircraft
Republic Aviation Corp.
Fairchild Aviation
Liberty Aircraft Products
Uxbridge Worsted Co.
Sperry Gyroscope Co.
Ranger Engineering Corp.
United American Bosch
Murray Body Corp.
Pratt and Whitney

PRESIDENT TO ASK NEW ARMS FUNDS; MORE NIGHT WORK

From *N. Y. Times* Sept. 2nd

★★★★★★

IVANHOE
"50 FOOT CANDLER"
"100 FOOT CANDLER"
RLM Continuous Wireway
FLUORESCENT LIGHTING SYSTEM

THE MILLER COMPANY
MERIDEN, CONN.
Pioneers in Good Lighting Since 1844

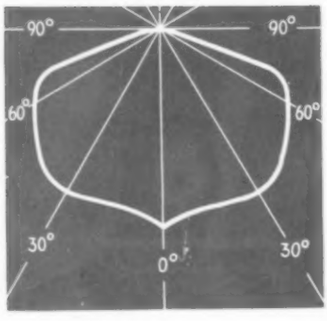
You can see this guaranteed and proven Fluorescent Lighting System at the fluorescent fixtures existing 18 months ago.

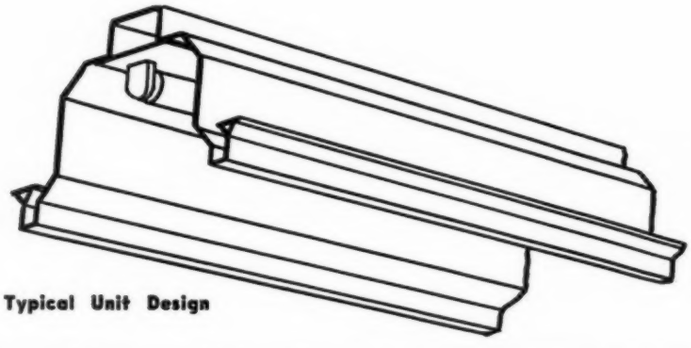
• MILLER OFFERS A COMPLETE LINE of incandescent and fluorescent lighting equipment, backed by almost 100 years of commercial and industrial lighting specification. There is an answer to your problems in this unbiased lighting service.

Fluorescent Industrial Units

Group D . . . CONTINUOUS TROFFER (For Flush Mounting)

Typical Distribution





Typical Unit Design

THE continuous troffer type fixtures accommodate one or two rows of 15, 20, 30 or 40 watt or one row of 100 watt fluorescent lamps. Designed for installation flush with the ceiling surface, the fixtures are either equipped with a plaster ring or are so constructed that they may be snapped directly into the tee-bar hangers of an acoustic tile ceiling. The fixtures are 12 inches in width, to conform with standard tile, and require about 10 inches free space above the ceiling. The reflector which is of baked enamel may be equipped with louvers or glass diffusing panels. In use, the fixture is concealed from view and appears to be a part of the ceiling.

RECOMMENDED APPLICATIONS

For general lighting in all areas with suspended ceilings, wherever appearance is important. For example, in modern windowless factory areas where the lighting should blend with the rest of the plant.

PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL	
LARGE ROOM*	AVERAGE ROOM**	1–40 Watt***	1–100 Watt***
50	46	20	40
33	31	30	60
20	18	50	100

*Width 10 times mounting height. **Width 4 times mounting height.
*** 3500° White Lamps

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning installations with the selected fixture, actual figures should be obtained from the manufacturer's catalog.



RECESSED TROFFER *system mounted flush in an acoustic tile ceiling provides 60 foot-candles of fluorescent illumination in this weave room.*



No Wonder *Mitchell* is the "Electrical Contractor's FLUORESCENT Line"

MITCHELL HAS THE RIGHT CONTRACTOR POLICY

We believe in you—the Electrical Contractor. We recognize in you the logical channel for steady business and ethical progress in this new Fluorescent business. We believe that the Electrical Contractor alone can assure good Value and good Service to the ultimate user. And because we hold this belief, we have from the beginning determined to play ball with the Contractor on the basis of a policy that entitles you to the protection, the profit, and the cooperation your service and skill deserve. Here are the plain facts of that policy:



MITCHELL Fluorescent Units are sold only through a select group of franchised wholesalers who are contractor-minded — who are cooperative, helpful—willing to work with you



The MITCHELL line has clean distribution. You will never run into competition from fixture "peddlers", "poachers" or mail order. You are protected on every bid you make.



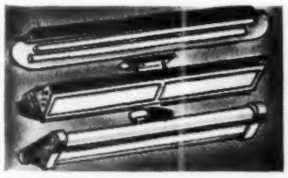
You are entitled to adequate profit margins, because in the last analysis, yours is the work and the responsibility. MITCHELL prices assure you attractive profits.



MITCHELL gives you all the concise, correct information and data you need. Sales aids and practical technical data help you sell easier, help you service easier.

MITCHELL HAS THE RIGHT CONTRACTOR LINE

It's the line that's styled-right, engineered-right, built-right—so that you can sell it with absolute confidence! It's Better Fluorescent Lighting and you can sell it easier because you can prove its superior quality by actual demonstration—right before your customer's eyes. Just check this proof—and you will see why MITCHELL is the *"Electrical Contractors' Line"!*



Just name your fixture for any job —and you will find MITCHELL has it! It's *The Complete Line* for the Contractor, covering every Industrial, Commercial, and Home Lighting application.



Only MITCHELL has the Triple-Label - *Fleur-o-lier Certification, *Underwriters' Approval, *MITCHELL's Own guarantee — the powerful 3-Way guarantee that helps you sell.



MITCHELL units are easier to install, easier to maintain. Starting is positive, quick; operation is trouble-free. No need for "extra service" that cuts into your profits.



Selling MITCHELL Better Lighting is a sure way to get hearty customer handshakes and repeat business. Yes, you build yourself a real future in Fluorescent with MITCHELL!

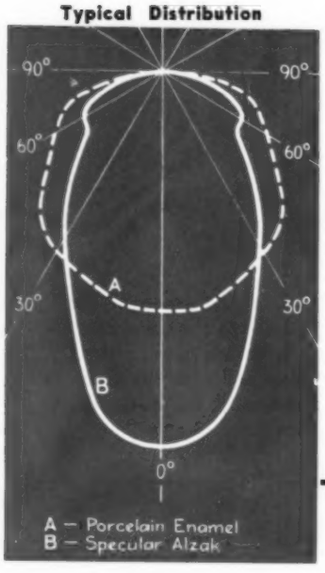
MR. CONTRACTOR: *IT PAYS TO SPECIFY MITCHELL!*

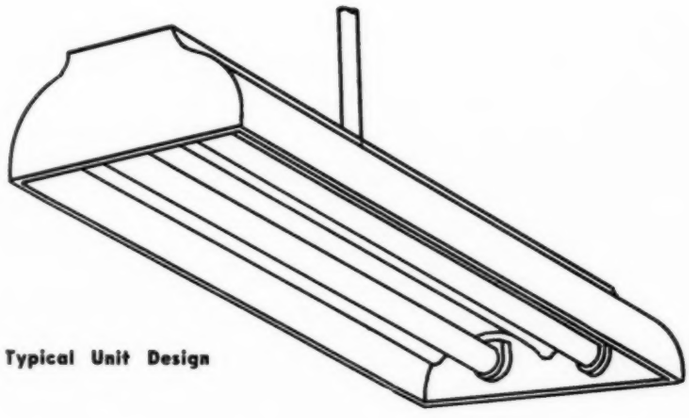


MITCHELL MANUFACTURING CO.
2525 N. Clybourn Ave., Chicago, Ill.
"A GREAT NAME IN LIGHTING"

Fluorescent Industrial Units

Group E . . . SUPPLEMENTARY LIGHTING FIXTURES





Typical Unit Design

THE concentrator type provides individual specular (mirror surface) reflectors for one, two or three lamps in 15 to 40 watt sizes. With Alzak aluminum, polished chrome, or similar surfaces on carefully shaped reflectors, the maximum light control obtainable with the fluorescent lamp is achieved. Channel and reflector combinations of various lengths, as well as complete single units are available. The diffusing type is similar in construction details and available sizes to the concentrator. The wider light distribution results from the use either of specially shaped specular surfaces, or of diffuse reflecting surfaces such as baked or porcelain enamel.

Both types are designed for chain, conduit or bracket mounting. Because of the efficiency of the fluorescent lamp, high level local lighting may be obtained with this type of fixture without the uncomfortable heat of similar incandescent units.

RECOMMENDED APPLICATIONS

Concentrators — For supplementary lighting of exacting seeing tasks in areas with good general illumination, with levels of 75 to 250 footcandles.

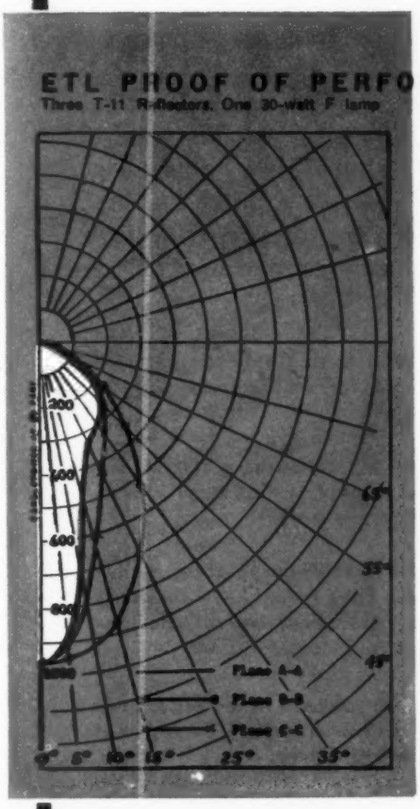
Diffusers — For supplementary lighting in areas where the general lighting is inadequate. For local-general lighting where the "spilled" light provides for safety and reduces harsh contrasts.



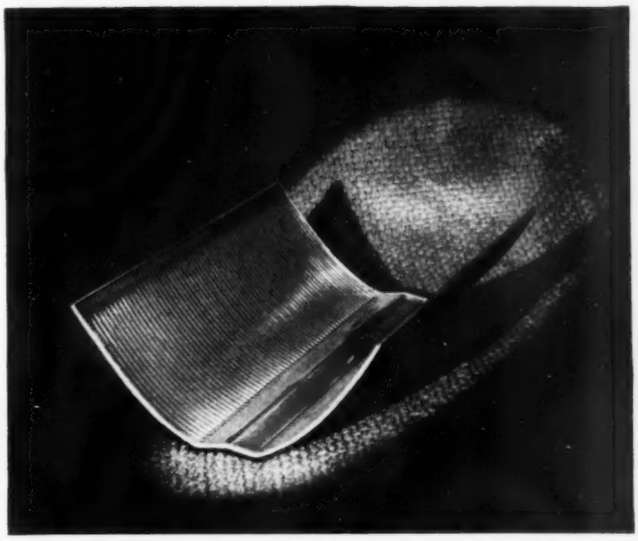
CRITICAL LIGHT *for critical seeing. Supplementary fluorescent units direct high intensity localized illumination where it is needed most.*

New PERMAFLECTOR BRINGS YOU FLUORESCENT PUNCH-LIGHTING *for the first time!*

THE PERFECT ANSWER TO *Fluorescent Light Control*



Compare this Electrical Testing Laboratories Distribution Curve against that of any other fluorescent reflector or control method.



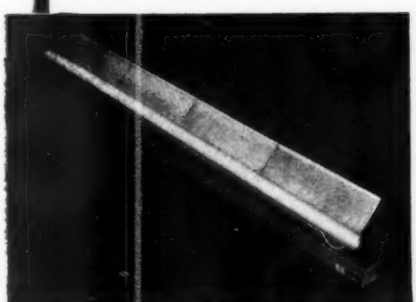
No. T-11 PERMAFLECTOR for use with the F Lamp.

NEW INTENSE CONCENTRATION, EFFICIENT CONTROL

Twenty-five years ago Pittsburgh Reflector Company introduced the first Permaflector—the silver mirrored glass reflector with the permanent efficiency—for use with incandescent lamps. Because of its remarkable efficiency and permanency the Permaflector has been recognized down through the years as the standard of efficiency in the incandescent lighting field. **Now, Pittsburgh announces a revolutionary development in the fluorescent lighting field**—PERMAFLECTOR No. T-11—for use with fluorescent lamps. This new specially designed silver mirrored Permaflector offers, for the first time, accurate **intense concentration** of fluorescent light, provides new, higher intensities at normal mounting heights and extends the range of lighting with fluorescent lamps. Higher mounting heights are now practicable!

NEW LIGHTING ECONOMY FOR FLUORESCENT USERS

Out of savings effected by increased efficiency in light control provided by T-11 PERMAFLECTORS, users can far more quickly offset the added cost of fluorescent installations. Since the T-11 PERMAFLECTOR produces over three times as much light in a direct beam than the average metal reflector it is obvious that a fluorescent user may obtain three times as much effective illumination for every dollar he spends for current. The savings resulting through making productive use of wasted light could easily wipe out the total cost of T-11 PERMAFLECTORS in two years!



Four No. T-11 PERMAFLECTORS mounted on KO-41 Strip with 40-watt, 48-inch F Lamp.

NEW PROFITS FOR ELECTRICAL CONTRACTORS

The new T-11 PERMAFLECTOR offers contractors their greatest profit opportunity for the 1941 lighting season because every fluorescent user will want their unequalled efficiency for new or old installations. Normal deliveries are assured as glass is not on the Priorities Critical List and its use conserves metal. A few-minute demonstration will clinch every sale! **Be first** in your locality to cash in. Call your local Permaflector Wholesaler or Representative or write direct to our Pittsburgh office **today.**

(*Sold Through Leading Wholesalers Everywhere*)

PITTSBURGH REFLECTOR CO.

403 OLIVER BUILDING

PITTSBURGH, PENNA.

PITTSBURGH REFLECTOR CO. EC-10-41
403 Oliver Building
Pittsburgh, Pa.

Please rush complete data on No. T-11 PERMAFLECTOR for fluorescent lamps

Name.....

Firm.....

Address.....

INCANDESCENT Industrial Units

OVER MANY YEARS of usage, incandescent industrial equipment has been developed and standardized in types which will satisfy the ordinary requirements presented by most industrial lighting problems. They group themselves naturally to provide a choice of the type required to meet a specific seeing task. The selection of the manufacturer may then be made with consideration for the quality, appearance and many conveniences offered for installation. Here we have—

GROUP F . . . . RLM Domes with porcelain enamel on steel reflecting surfaces that provide well distributed light for simple factory seeing tasks.

GROUP G . . . . Glassteel Diffusers combining a translucent glass diffusing bowl with an RLM type reflector to provide high quality, softly diffused lighting for more exacting eye work.

GROUP H . . . . Mercury Vapor Units, designed specifically to accommodate the highly efficient mercury lamps. They should have consideration in every cost analysis for installations where color and stroboscopic effect are not important considerations.

GROUP I . . . . Deep Bowl, High Bay Units with specular reflectors to solve the difficult problems of lighting in areas where fixtures must be mounted 20 feet or more above the floor.

GROUP J . . . . Supplementary Units, of many sizes, designs, and uses, available for rigid bracket, drop cord, or adjustable mounting. They must be used carefully and only to supplement general lighting.

GROUP K . . . . Protective Lighting Units for the floodlighting and spotlighting of factory properties. This equipment includes open and closed type floodlights, reflector lamps, street lighting units and searchlights. They are combined according to the character of the property to be guarded.

● Despite the standardization of incandescent equipment, every care should be taken to select the proper equipment for the seeing task involved. In some cases, special equipment, high in first cost, provides long-run economy.



FIRST *in* PERFORMANCE

RLM CERTIFIED

INDUSTRIAL *Fluorescent* LIGHTING UNITS

Engineered for Operation with **MAZDA** *Fluorescent Lamps*

● You can recommend RLM-labeled Fluorescent Lighting Fixtures with confidence that they will deliver maximum value in lighting efficiency and economy.

This label is the user's warranty that the unit to which it is affixed has been manufactured in compliance with quality-assuring specifications under the exacting procedure developed and administered by RLM Standards Institute. It certifies that the fixture, auxiliary control equipment, sockets and other component parts are properly engineered for co-ordinated operation with Mazda Fluorescent Lamps . . . that the fixture is identical to samples certified by Electrical Testing Laboratories under a rigid and continuous inspecting system at the factory of the manufacturer.

Now Available

RLM SPECIFICATION and CERTIFICATION FOR *Eight Types* OF INDUSTRIAL *Fluorescent* LIGHTING UNITS

1. Specification No. 5: 48" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit
2. Specification No. 6: 48" Fluorescent Three-Lamp Closed-End Porcelain Enamel Unit
3. Specification No. 7: 60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Unit
4. Specification No. 8: 60" Fluorescent Two-Lamp Closed-End Porcelain Enamel Diffuser Unit
5. Specification No. 9: 48" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit
6. Specification No. 10: 48" Fluorescent Three-Lamp Open-End Porcelain Enamel Unit
7. Specification No. 11: 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Unit
8. Specification No. 12: 60" Fluorescent Two-Lamp Open-End Porcelain Enamel Diffuser Unit

Write for Copies of these Specifications

The RLM Industrial Fluorescent Lighting Fixture Specifications listed above were developed by RLM Standards Institute—a non-profit organization operated to develop and promulgate standard specifications for the efficient performance of industrial lighting equipment. *Copies are available on request.*

Guarantee

All RLM certified fluorescent lighting units are guaranteed against mechanical and electrical defects for a period of ninety (90) days from date of delivery to the purchaser. Correction of such defects by repair or replacement of material only shall constitute fulfillment of all obligations under this guarantee by the undersigned manufacturer or its distributor.

RLM certified fluorescent lighting units are engineered for operation with Mazda fluorescent lamps to give maximum light output and trouble-free operation when properly installed and under normal conditions of use.

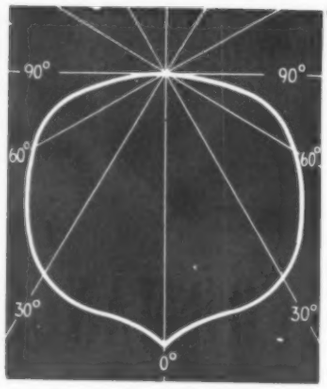
The Letters RLM Stand for Reflector and Lighting Equipment Manufacturers

RLM STANDARDS INSTITUTE
INCORPORATED

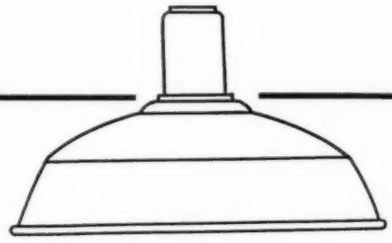
307 N. MICHIGAN AVE. • SUITE 1600 • CHICAGO, ILL.

Incandescent Industrial Units

Group F . . . THE RLM DOME



Typical Distribution



Typical Unit Design

THIS dome shaped steel reflector, available in 12- to 16-inch diameters to accommodate 100 to 1000 watt white bowl lamps, is porcelain enameled for high lighting efficiency and durability. To meet the reflector and lamp manufacturers' standard, the reflector efficiency must be 75 per cent or better and a shielding angle of 17½ degrees from the horizontal must be maintained. The wide mouth and high quality reflecting surface provides for wide distribution of light and also for convenient maintenance. Both vertical and horizontal working planes receive adequate illumination. Dust tight glass covers are available for use where smoke or dust is likely to reduce the efficiency of the reflecting surface.

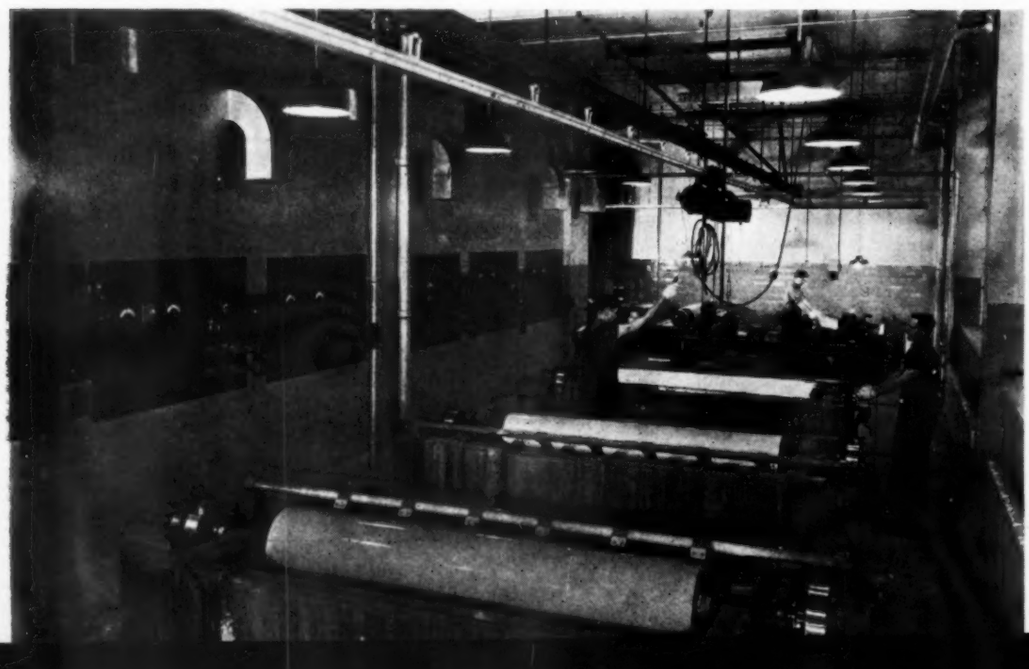
RECOMMENDED APPLICATIONS

For general lighting in manufacturing, packing, or shipping areas where uniform illumination of 10 to 60 foot-candles is desired. Heavy duty units designed for rough usage are available.

PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM	AVERAGE ROOM	White Bowl Lamps		
		100 Watt	200 Watt	500 Watt
64	54	10	25	65
85	72	7	18	50
169	144		8	25
256	225			17

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.



PLATING ROOM *in this autogravure plant is lighted by symmetrically spaced RLM dome incandescent units. Good lighting is necessary to see that press rolls receive an even coating of copper.*



To Increase Production
To Conserve Manpower
To Prevent Material Waste

Better Lighting is Vital to the Defense Program!

NEVER before has industry's need for Better Lighting been so vital to the nation's welfare! In ship yards, aircraft factories, naval bases and munitions plants... in the daily growing list of tens of thousands of plants devoted to Defense production... American workers must be given Better Lighting to see faster and easier and work with greater speed, accuracy and less fatigue.

Better Lighting is vital to this effort. For, as proven by scientific tests and in actual operation, Good Lighting increases the speed of seeing and conserves energy. Objects and defects invisible to the average eye under poor light become easily visible when enough light is provided. Thus, good lighting makes it easy to see fine details and improves the quality and quantity of production.

The basis of Better Lighting is MORE LIGHT. Employees engaged in Defense Production need from 35 to 75 footcandles of light for good seeing and sustained production effort. Even these high levels are less than workers near windows usually receive on clear summer days.

Not only MORE LIGHT but also the RIGHT KIND OF LIGHTING is involved in Better Lighting as provided by Benjamin Equipment. The lighting equipment must be designed in accordance with established principles of the Science of Illumination to insure the even distribution of light over the working surface; to provide light that is soft and diffused; to minimize reflected glare; to shield adequately the lamps so that the eyes are protected from fatiguing glare.

Naturally Benjamin's first duty is to satisfy the Better Lighting requirements of Defense Projects so that uniform seeing efficiency may prevail in every department, for all employees, at every time of day and night.

In fulfilling this duty, Benjamin is taxing every resource to provide the fluorescent lighting equipment... the incandescent and mercury lighting units... the explosion proof and vapor proof units... the floodlighting equipment... so essential to the Better Lighting required by National Defense.

But Benjamin is cognizant, too, of the existing need for Better Lighting to conserve the eyesight of workers in all industries. To the extent that materials are available, Benjamin will make every effort to continue to serve those industries, which, while not directly engaged in Defense production, nevertheless, contribute to the common objectives of our nation.

In developing lighting plans, consult the data and specifications shown in Benjamin Catalog No. 26. Benjamin Electric Mfg. Co., Dept. H, Des Plaines, Illinois.

BENJAMIN TRADE MARK

WORLD LEADER IN INDUSTRIAL

LIGHTING EQUIPMENT

DISTRIBUTED EXCLUSIVELY THROUGH ELECTRICAL WHOLESALERS

A FEW OF THE HUNDREDS OF DEFENSE PROJECTS LIGHTED BY BENJAMIN

TO PROVIDE *Keener Eyes for the Eagle!*

Allis-Chalmers Manufacturing Company, American Car and Foundry Company, Bendix Aviation Corporation, Bridgeport Brass Company, Caterpillar Tractor Co., Colt's Patent Fire Arms Mfg. Co., Curtiss-Wright Corporation, Douglas Aircraft Company, Inc., The Dow Chemical Company, Electric Boat Company, Hercules Powder Company, Kingsbury Ordnance Plant, Lockheed Aircraft Corporation, The Glenn L. Martin Co., North American Aviation, Inc., Ravenna Ordnance Plant, Remington Arms Company, Inc., St. Louis Ordnance Plant, Vultee Aircraft, Inc., Winchester Repeating Arms Company.

Incandescent Industrial Units

Group G . . . THE GLASSTEEL DIFFUSER



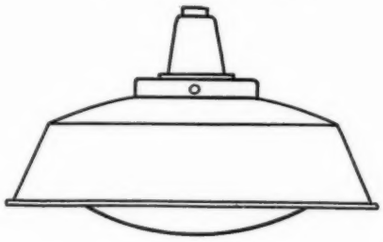
Typical Distribution

HE glassteel diffuser consists of a diffusing glass globe and a dome shaped steel reflector 18- to 24-inches in diameter, accommodating 150 to 1000 watt lamps. The reflector is porcelain enamelled on both the reflector and outside surfaces and may be obtained with apertures in the top.

An improvement on the RLM type, the diffusing globe provides even better distribution and a larger area source with low brightness. The light which reaches the ceiling through the apertures provides a slight improvement in the general illumination and reduces harsh contrasts between the ceiling and the light source.

Blue glass globes are available which provide improved color quality in the light from this type of unit. A dome shaped diffuser is available also for use with the 300 and 500 watt silvered bowl lamps. Including an inner aluminum reflector, this type of unit has a higher surface brightness and provides slightly higher foot-candle values than corresponding glassteel units.

Typical Unit Design



RECOMMENDED APPLICATIONS

For general lighting wherever the large area and low surface brightness will aid in eliminating annoying glare. For illumination levels of 10 to 60 foot-candles where a soft light without sharp shadows is desirable.

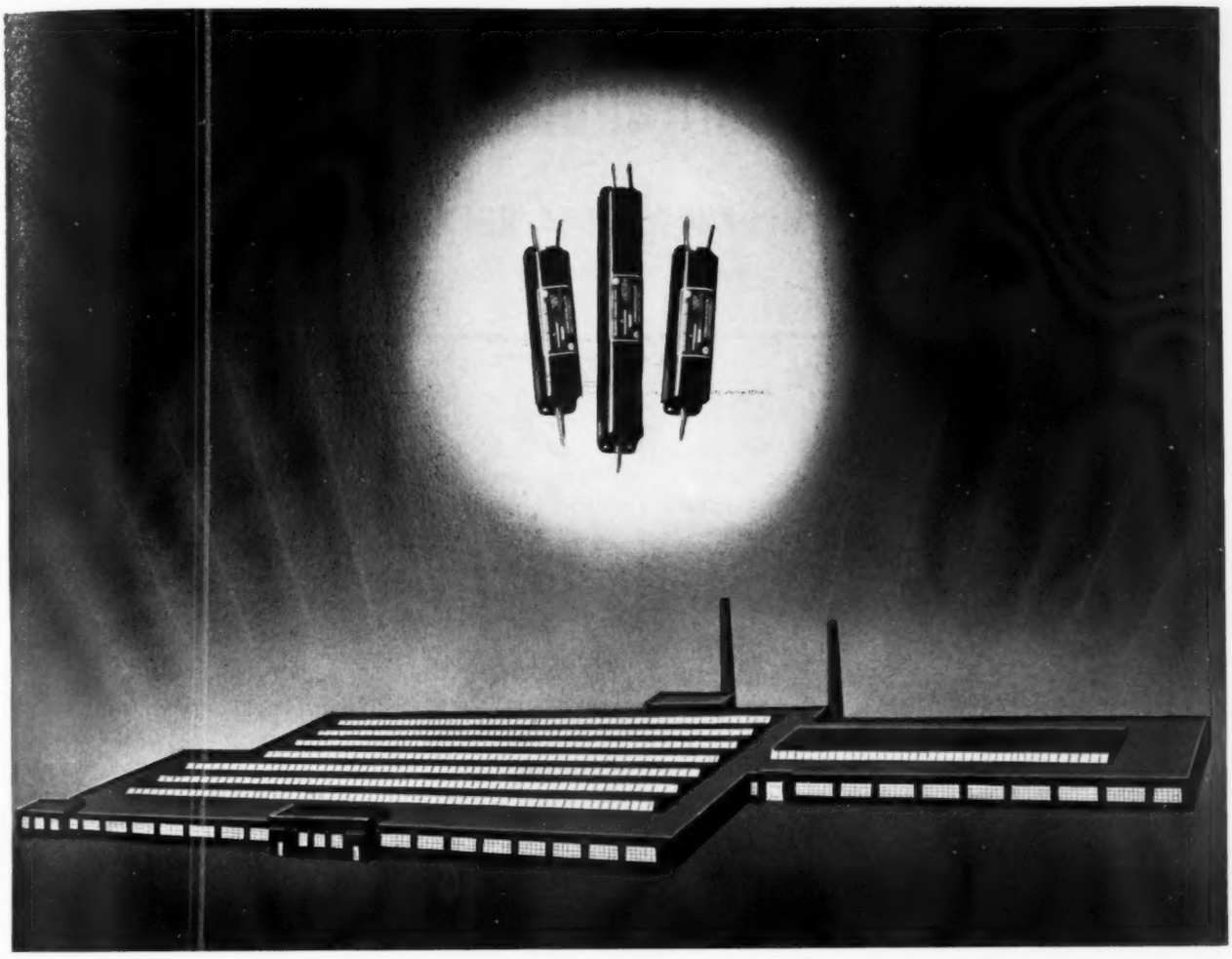
PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVELS		
LARGE ROOM	AVERAGE ROOM	200 Watt	300 Watt	500 Watt
64	54	20	33	58
85	72	15	24	45
169	144	6	12	21
256	225		8	15

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.



ACRES OF LIGHT. *Aircraft assembly speeds along under the broad expanse of evenly diffused light from hundreds of glassteel diffusing units.*



CHICAGO TRANSFORMER PLANT

TURNING NIGHT INTO DAY . . .

Fluorescent Lighting Steps Up Production by Speeding Sight and Lessening Fatigue

Peak efficiency on all three shifts is required of today's machines and their operators. Modern equipment pressed to unheard of output has reached a speed that necessitates helping the worker in every way to keep up with the defense speed-up.

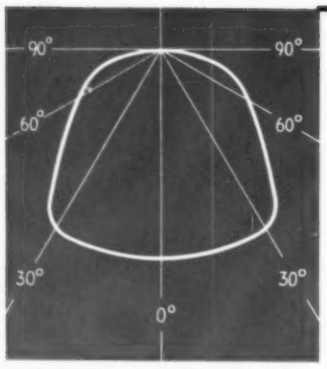
It has long been recognized that eyestrain is a leading factor in fatigue and that proper light speeds sight. It is little wonder that the major industries of the country have selected High Intensity Fluorescent Lighting, the closest thing to daylight, to cut the worker's fatigue, to increase efficiency, and to keep him in tune with the present day pace.

It has been the privilege of the Chicago Transformer Corporation to be a contributing factor to Fluorescent, the New Type Light, with increased efficiency and economy.

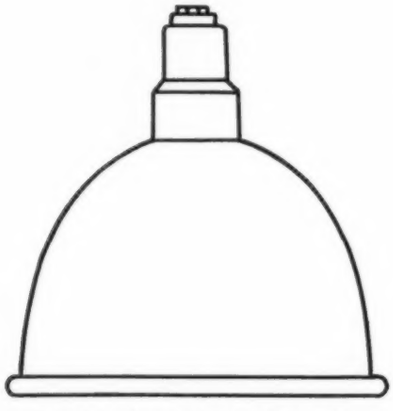
CHICAGO TRANSFORMER
CORPORATION
3501 WEST ADDISON STREET • CHICAGO

Incandescent Industrial Units

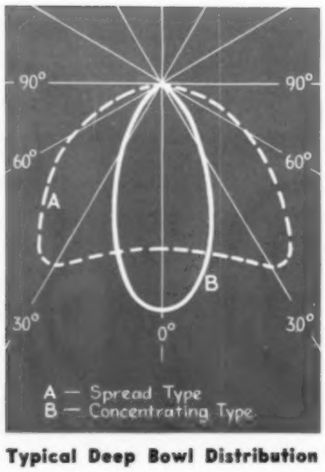
Group H . . . MERCURY VAPOR UNITS



Typical Shallow Bowl Distribution



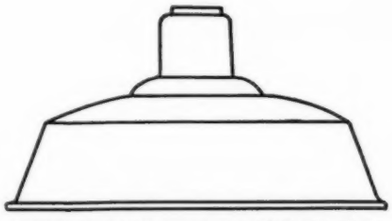
Typical Deep Bowl Unit Design



Typical Deep Bowl Distribution

TWO hundred fifty watt and 400 watt high intensity mercury vapor lamps operate only on alternating current, require a current controlling transformer and special fixtures. However, due to the high light output of the lamps, and their long life, (3000 hours) mercury vapor installations often prove to be the most economical for large industrial areas.

Deep bowl reflectors of spun aluminum, porcelain enamelled steel, silvered or prismatic glass and also shallow bowl of porcelain enamelled steel are designed for use with these lamps. The heavy transformers are usually contained and mounted in a separate steel case for maintenance and installation convenience. Two-lamp transformers are available which, by operating two lamps out of phase, reduce the flicker characteristic of arc lamps on alternating current. They also provide power factors of 90 per cent or better.



Typical Shallow Bowl Unit Design

RECOMMENDED APPLICATIONS

For large industrial installations—400 watt units for high bay mounting where voltage is well regulated and interruptions in service are infrequent. Where color discrimination is important, units should be alternated with incandescent units of double wattage. For general lighting in rough manufacturing operations where continuous use is the rule.

Because of the warming period which the lamp requires at starting before coming to full brilliance, this type of unit must not be switched on and off too frequently. The 250 watt units should be used for installations with lower mounting heights, particularly the shallow bowl type.

PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE	AVERAGE MAINTAINED FOOT-CANDLE LEVEL			
LARGE ROOM	Dome Type 250 Watt Mercury	Dome Type 400 Watt Mercury	Deep Bowl Type 250 Watt	Deep Bowl Type 400 Watt
144	22	48	24	45
225	15	32	15	30
400	7	16	9	15

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

For RELIABLE, LOW-COST
High-power-factor Fluorescent Installations



G-E Tulamp Ballasts



G-E High-power-factor Single-lamp Ballasts

FOR a very small increase in over-all fixture costs, all the important advantages of *high power-factor* are available for fluorescent-lamp installations. Fixtures equipped with G-E high-power-factor, single-lamp ballasts or Tulamp ballasts operate at power-factors of 90 per cent or above and comply fully with all power-factor regulations of public utilities and regulatory bodies. G-E high-power-factor ballasts provide important installation and operating economies. They give:

1. Greater capacity of wiring by reducing the current required by each lamp—thus reducing wiring costs on new installations.
2. Lower losses and better voltage regulation in feeders and branch circuits—for improved performance and economy.

In addition, reliability and long life are built into every G-E ballast. Designs are carefully co-ordinated with lamp characteristics. Modern manufacturing facilities such as automatic coil-winding machines assure uniformity of characteristics in all ballasts of the same rating. Depending on rating, every ballast receives from 7 to 10 separate tests during manufacture.

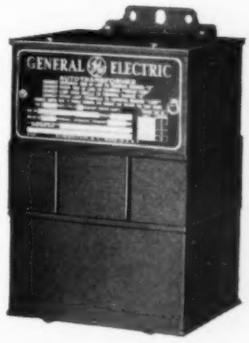
All G-E ballasts are listed by the Underwriters' Laboratories, and all G-E Tulamp ballasts are certified by the Electrical Testing Laboratories.

These factors—correct design, careful manufacture, and thorough testing—combine to make G.E.'s the best buy in ballasts.

EXTRA SAVINGS WITH G-E TULAMP TRANSFORMERS FOR MERCURY LIGHTING

G-E Tulamp transformers for MAZDA H (mercury) lamps offer all the advantages of high-power-factor fluorescent ballasts—plus extra savings in installation cost. By using one transformer to supply two outlets, wiring is simplified, and installation time and costs are reduced.

The use of G-E Tulamp transformers (available for the 400-watt MAZDA H lamp) adds only about 3½ per cent to the over-all cost of transformers, lamps, and fixtures. Single-lamp high-power-factor transformers are available for both the 400-watt and 250-watt lamps.



Ask the nearest G-E distributor or G-E office for complete information—Bulletin GEA-3293, "Ballasts for Fluorescent MAZDA Lamps," and Bulletin GED-855, "Transformers for MAZDA H Lamps." General Electric Co., Schenectady, N. Y.

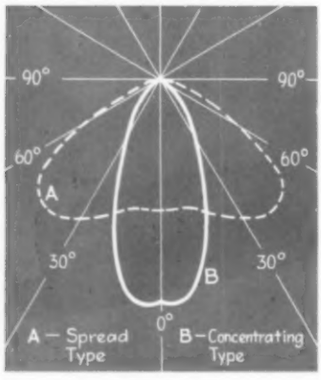
GENERAL ELECTRIC

405-1-2205

Incandescent Industrial Units

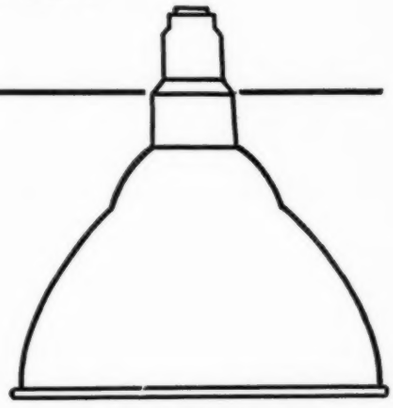
Group I . . . THE DEEP BOWL-HIGH BAY UNIT

Typical Distribution



ALUMINUM, silvered glass and prismatic glass reflecting surfaces in deep bowl shapes are used to provide the control of light necessary to efficiently illuminate working planes in high bay areas. The aluminum is usually the inner surface of a heavy gauge, spun aluminum bowl. The chromium is necessarily plated on a pre-formed metal bowl. The glass types are glass bowls which fit into neat metal housings for support and protection.

Where the light must travel a considerable distance (15 feet or more) before reaching the working plane, the high bay unit is superior to other types. Units are available which will accommodate 200 to 1500 watt incandescent lamps and the 250 and 400 watt mercury vapor lamps. By careful design of reflectors, both concentrating and wide spread distribution characteristics are obtained.



Typical Unit Design

RECOMMENDED APPLICATIONS

For general lighting in high bay areas, crane ways or light wells, in narrow rooms where absorption by walls or windows may result in marked reductions in efficiency. Combinations of mercury vapor and incandescent units will provide improved color quality.

PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE	AVERAGE MAINTAINED FOOT-CANDLE LEVEL				
LARGE ROOM	200 Watt Incandescent	500 Watt Incandescent	1500 Watt Incandescent	250 Watt Mercury	400 Watt Mercury
144	10	35		24	50
255	7	20	70	15	30
400	4	10	40	9	17

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

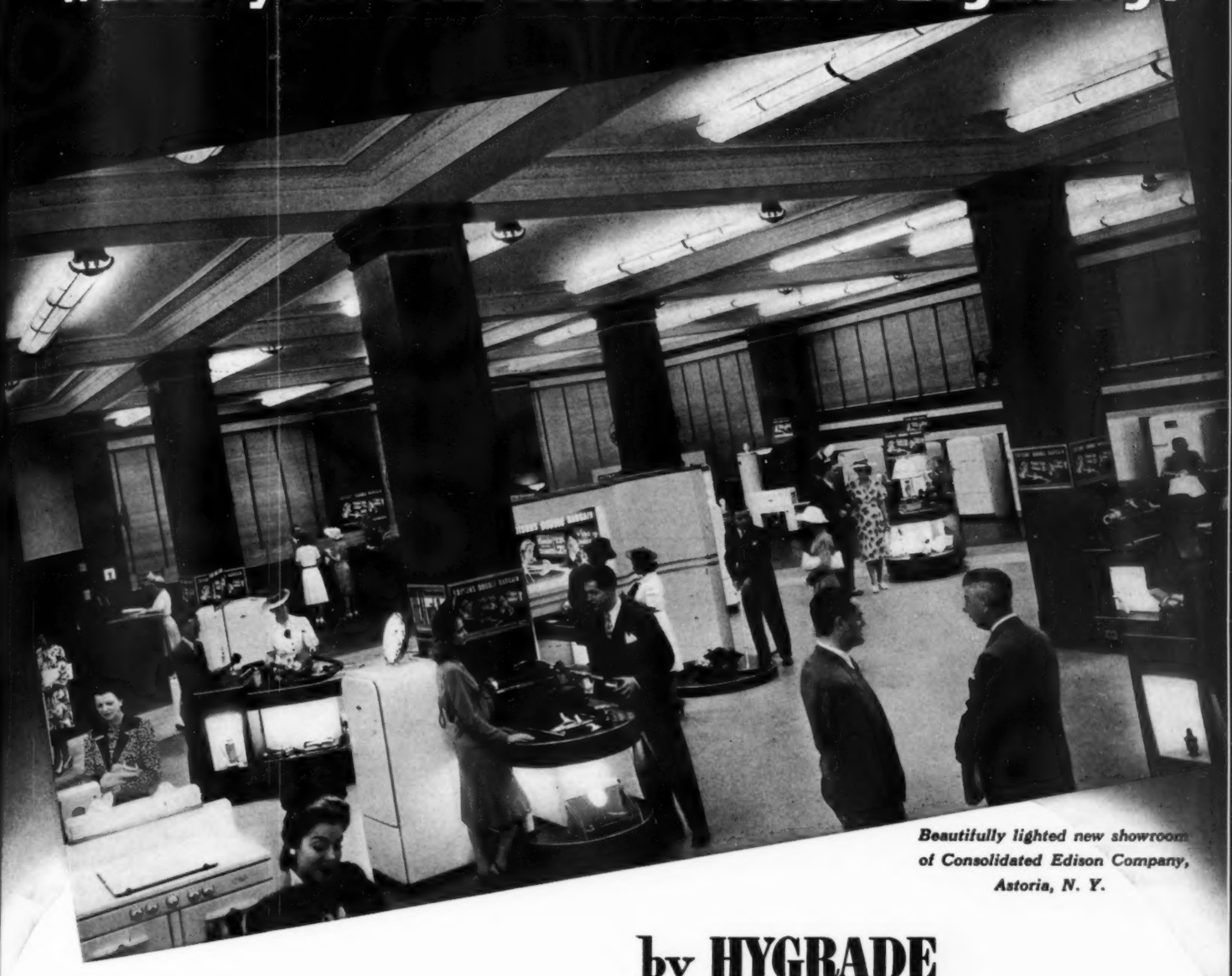
HIGH BAY SYSTEM *of general lighting produces an average illumination level of 22 foot-candles over the working plane of this textile machinery manufacturing plant.*



COMBINATION LIGHTING *in the high bay section of this plant employs a staggered system of incandescent and mercury vapor units for improved color quality.*



DON'T SELL YOURSELF "SHORT"
when you sell Fluorescent Lighting!



Beautifully lighted new showroom of Consolidated Edison Company, Astoria, N. Y.

by HYGRADE

SURE—sometimes it's lots easier to sell "cheap" fluorescent lighting equipment, but — man! — how that "cheap" equipment *backfires!*

More money for you!

That's why HYGRADE employs *only the best—in engineering brains—materials* — and *fine workmanship* . . . because we've learned that the quickest way to volume and profit—for you *and* us — is to sell *quality* products.

Everything's right!

Finer fixtures that assure 100% *customer-satisfaction*—designed, engineered, built, assembled, shipped and guaranteed by HYGRADE! Lamps that *look* better — keep their brightness longer from end to end. Starters that really start and re-start! *A complete line of finer fluorescent lighting* equipment to help you do a *completely finer* lighting job!

Write us today — for complete information on HYGRADE Fluorescent Lighting Equipment. Address:

HYGRADE SYLVANIA CORPORATION
Dept. E1, Salem, Mass. Est. 1901.

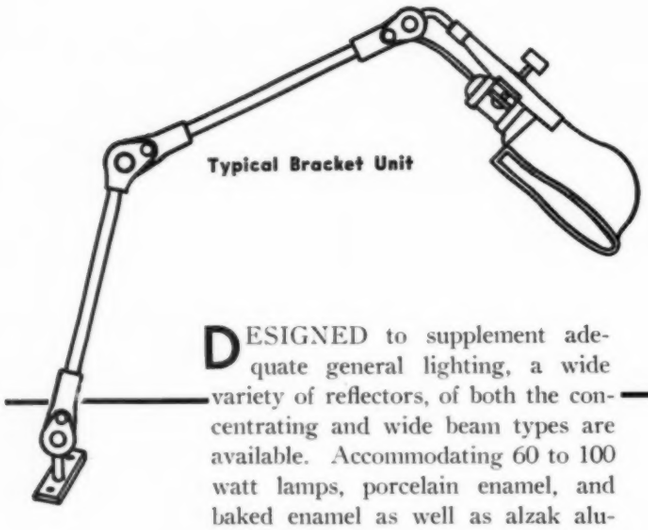
Also makers of Hygrade Incandescent Lamps and Sylvania Radio Tubes. Factories in Emporium, Pa., St. Marys, Pa., and Towanda, Pa., Salem, Mass., Ipswich, Mass., Danvers, Mass.

HYGRADE-

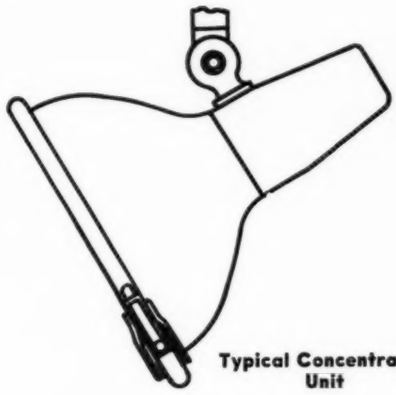
Everything in Fluorescent at its Finest!

Incandescent Industrial Units

Group J . . . SUPPLEMENTARY LIGHTING



Typical Bracket Unit



Typical Concentrator Unit

DESIGNED to supplement adequate general lighting, a wide variety of reflectors, of both the concentrating and wide beam types are available. Accommodating 60 to 100 watt lamps, porcelain enamel, and baked enamel as well as alzak aluminum surfaces are common. When it is possible to mount these units within one to two feet of the working area, 50 to 300 foot-candles of supplementary lighting may be obtained over small areas (1–2 square feet).

These units may be supported on drop cords, by rigid or adjustable brackets attached to the building or bench or by special mounts on machinery.

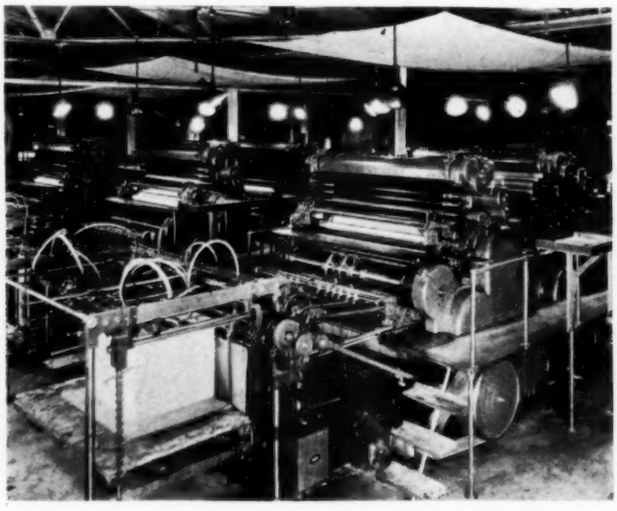
RECOMMENDED APPLICATIONS

For *Supplementary Lighting only.* When exacting eye tasks demand 100 or more foot-candles for small working areas, local lighting units will improve lighting conditions when used with good general lighting. Care must be taken in order that no glare will reach the eye of the worker, either directly from the lamp itself or by reflection from the working surface.

HIGHLIGHTING IMPORTANT *work areas on these lathes is accomplished by using auxiliary flexible-arm, bracket units, mounted directly to the machine.*



CONCENTRATED LIGHT *over color presses in this printing plant is provided by adjustable, suspension mounted industrial concentrating units.*



THE EYES OF INDUSTRY ARE KEENER



WITH CONTROLLED FLUORESCENT LIGHTING

The American defense effort means longer hours in the factory and the office, it means night shifts and the necessity for increased production from the same machines and men.

To get maximum results from these new efforts, industry needs the best and most abundant lighting it can get. In the factory good lighting reduces hesitation and fatigue, permitting faster production schedules; in the drafting room more accurate drawings can be produced in less time; in the office good lighting reduces clerical errors and results in faster, better work.

Curtis Lighting is proud of the contribution it is making to the defense effort—Curtis fixtures are rugged efficient, and practical, designed to do a job.

The two-lamp industrial unit illustrated above has the new "V" shaped reflectors, closed ends, and Fluracite reflecting surface. Two sizes are available; for 48" and 60" fluorescent lamps. Write for Serial 2045 for full details.

CURTIS LIGHTING, INC.

6135 WEST 65TH STREET . . . . CHICAGO

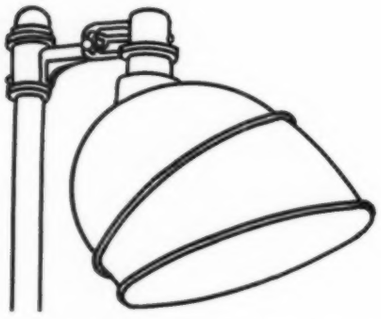
Incandescent Industrial Units

Group K . . . PROTECTIVE EQUIPMENT

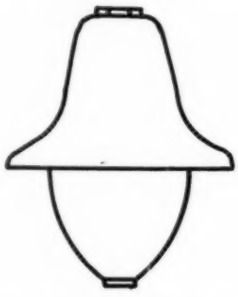
PROTECTIVE lighting has progressed rapidly through the adaptation of available outdoor lighting equipment to the special requirements of the national emergency. A wide variety of equipment is now used—applied to the different conditions found on factory properties.

Protective lighting installations must be completely reliable—resistant to weather, mechanical damage, sabotage. The failure of a part of the system must not leave a vulnerable area unprotected. The installation must discourage attempts at entry, but should entry be effected, the lighting coverage must make detection a certainty. Protective lighting must aid the guard and hinder the intruder in every possible way.

The following classes of equipment are available—



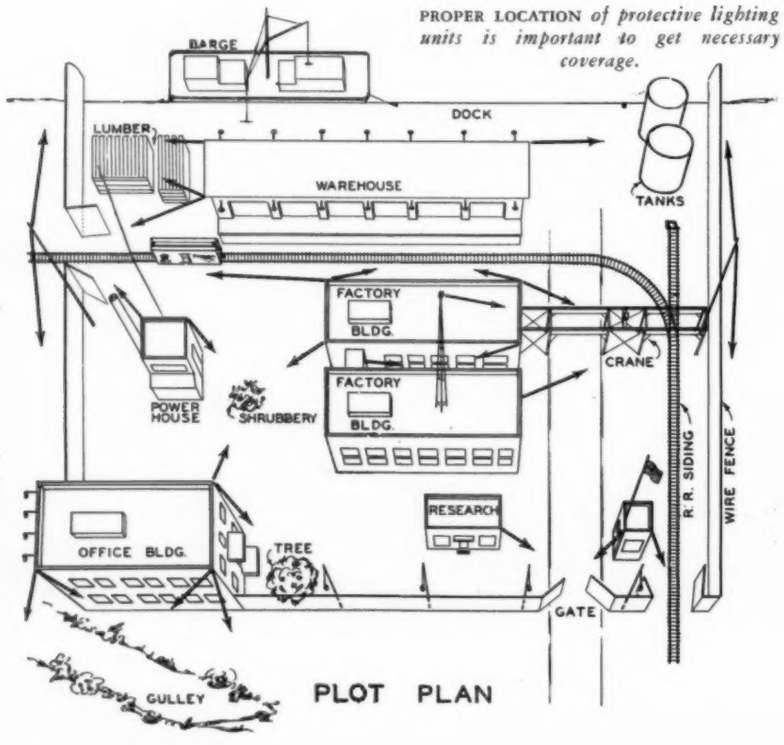
1. *Open Type Floodlights*—Porcelain enamel on steel for general illumination of large areas, with a wide beam spread. Obtainable with auxiliary aluminum directional reflectors for highlighting special areas.



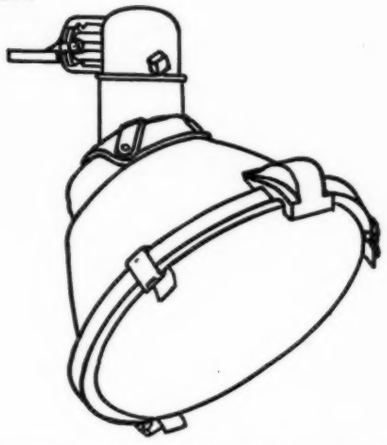
2. *Street Lighting Units*—Reflectors with lens controlled distribution for lighting fence lines, roadways, wide passageways between buildings, etc.

Note: A fresnel lens unit, developed specifically for fence lighting has proved highly successful in recent installations, providing uniform levels with good utilization in the vertical planes. This is a most important feature in protective installations.

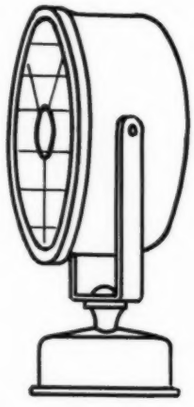
PROPER LOCATION *of protective lighting units is important to get necessary coverage.*



PLOT PLAN



3. *Closed Type Floodlights*—Alzak aluminum reflectors designed for wide or narrow beam control. They provide for general illmination of large areas, or high levels around gateways, or particularly vulnerable positions, or for high mounting long distance projection. The closed type is more convenient in maintenance and gives a high maintained efficiency.



4. *Searchlights*—Narrow beam, high candlepower units with pilot house controls for use at sentry boxes and gateways. Light weight portable units for use under emergency conditions.

5. *Reflector Lamps*—Lamps with flood or spot distribution for sign lighting, illumination of gateways, doors, control stations or similar small areas where higher levels are required than are provided by the general floodlighting.

Electrical Contracting, October 1941

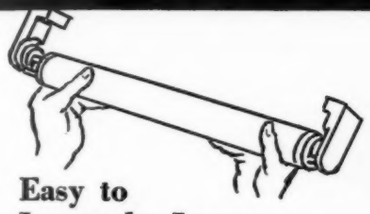
All that Others Offer

+Plus

+ plus 3 new, major improvements.
+ plus POSITIVE contact.
— minus costly breakage and costly fixture assembly.

Lloyd Rotator Twist-Type Lamp Holder

Was Created by
LLOYD ENGINEERS



1 Easy to Insert the Lamp

Place one terminal pin in slot. A half-turn in either direction does the trick. No strain on pins or casing.

Twist — Click — It's Locked. Positive contact.

Absolutely simple, fool-proof action.

2 Strong Bakelite Casing

Made of high strength materials. Head beveled at top. Gives extra clearance for inserting lamp. Prevents strain on pins and casing.

Nut-Retainer Slot makes mounting easy, fast and economical.



Twist-type lamp holder
Black-Cat. 351
White-Cat. 351-W
Pats. Pend.



3 Tempered Steel Spring for Double Duty

Steel spring more than doubles holding strength of lock with no loss of flexibility.

No other twist-type holder has it.

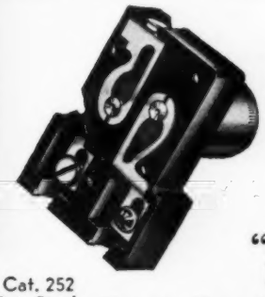
Makes absolute contact.

You feel it and hear it lock.



Lloyd Twist-Type Lamp Holder with Starter Socket

Black-Cat. 353
White-Cat. 353-W
Combined with Starter Socket
Cat. 252
Pats. Pend.



4 Lloyd Starter Socket With "Lobster Claw" Dual Lock

Cat. 252
Pat. Pend.

The vise-like grip of the "Lobster Claw" absolutely locks starter pins. Makes perfect contact. Can't come loose. Exclusive with Lloyd.

Listed and approved by Underwriters' Laboratories Inc.

LLOYD PRODUCTS CO.
PROVIDENCE, R. I.

Starter Switches
FS-2
FS-4
Certified by
Electrical Testing
Laboratories Spec. 6

REPRESENTATIVES—BRANCH OFFICES AND WAREHOUSES IN 22 LEADING CITIES

LLOYD POLICY INSURES QUALITY

FLUORESCENT
Commercial Units

THE NUMBER of manufacturers now in the market and the variety of designs offered in commercial fluorescent lighting equipment today is unbelievable when we remember that the lamp is only three years old. Because of the factor of decoration, which is of considerable importance in commercial equipment, there is never complete standardization. Too often, however, decorative elements are "pasted on" and add little to the appearance of the units. However, it is still possible to pick out basic design characteristics which allow classification by types. For example:

GROUP L . . . . Suspension Type Fixtures, of proper proportions and mounting height, add to the appearance of high ceiling areas. With careful planning, uneven ceilings broken by wiring, plumbing, and other construction elements can be dominated by attractive suspended units mounted symmetrically and in one norizontal plane.

GROUP M . . . . Surface Mounting Units, a necessity on low ceilings, are easily adapted to "custom tailored" architectural treatments and may be used separately or in continuous mounting rows. This flexibility has made their use popular even for relatively high mountings.

GROUP N . . . . The Recessed Troffer is another solution for the low ceiling area, where space is available above a ceiling, designed for simple installation in lines or rectangular forms. With louvers or diffusing glass, the brightness of the troffer is comfortably low. The distribution with high illumination levels is excellent.

GROUP O . . . . Continuous Strip, raceway or wiring channel, is the most flexible of the available fluorescent equipment. It is useful in the design of architectural elements, and the many types available suggest simple solutions to most built-in lighting problems.

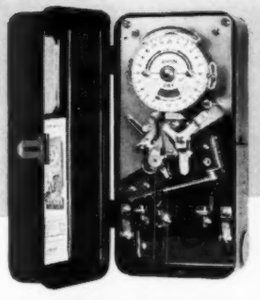
GROUP P . . . . Show Window Units for fluorescent lamps are available in all sizes to provide general illumination for every type of display window.

● Good equipment, electrically and mechanically free from defects, is more than ever important in the fluorescent field. Choose every product carefully.

STEP UP
THE EFFECTIVENESS OF PROTECTIVE FLOODLIGHTING WITH AUTOMATIC CONTROL



WESTINGHOUSE PHOTO



Form KAZ Astronomic Dial Time-Switch can be set to go "on" at dusk, "off" at dawn, automatically changing daily with suntime.



Form VSWZ, with carry-over is the time-switch which continues to run during current interruptions. The astronomic dial feature is also included.

SANGAMO TIME • SWITCHES

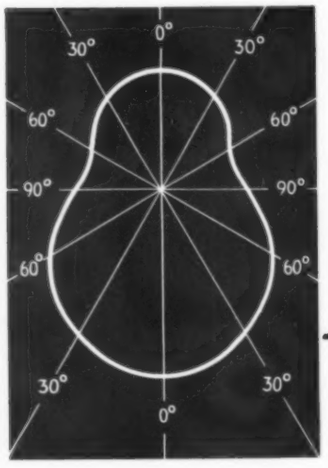
Protective lighting for building approaches, storage yards, transformer banks, and other vital property in defense plants is a most effective method of safeguarding such property. The value of this protection is increased considerably when a Sangamo Time-Switch automatically controls the lights. With a Sangamo Time-Switch the lights are turned "on" and "off" punctually and reliably—"forgetting" is eliminated. Ask for Catalog No. 1000; one of the many forms of Sangamo Time-Switches shown in this catalog is sure to fit your specific requirements.

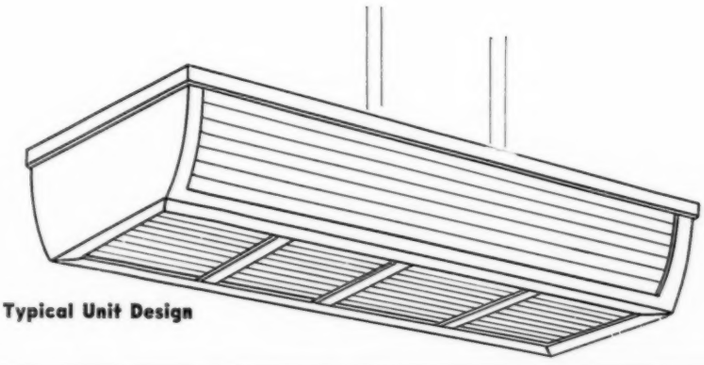
SANGAMO ELECTRIC COMPANY SPRINGFIELD ILLINOIS

Fluorescent Commercial Units

Group L . . . SUSPENSION MOUNTING TYPE

Typical Distribution





Typical Unit Design

THIS fixture may include a reflector, usually of baked enamel on steel, or the light may spread directly from the lamps without striking a reflecting surface. However, glass and plastic diffusing panels are commonly used to reduce brightness and shield the eye. Also metal louvers are sometimes employed for this purpose. Distribution varies from the toally direct to the totally indirect with the majority of fixtures sending light both up and down.

The suspension type unit is supported by one or two sections of metal tubing which is often fluted or otherwise decorated. The metal housing contains the ballast and supports the reflector, lampholders and end caps. The tubing is concealed at the upper end by a ceiling canopy which also hides the outlet box and lead wires. Available fixtures accommodate two to six lamps from 15 to 100 watts in size, arranged parallel to a central axis or in a horizontal plane.

Models are available that provide for continuous mounting.

RECOMMENDED APPLICATIONS

For general lighting wherever mounting heights are equal to or greater than eight feet. Distances from the ceiling should not exceed quarter of the spacing between units. They are recommended particularly where ceiling conditions will not permit surface mounting.

PERFORMANCE CHART—Characteristics of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM	AVERAGE ROOM	2–40 Watt	3–40 Watt	4–40 Watt
40	32	34	50	65
68	52	22	20	40
100	85	14	45	25

Note: Considerable variations may be expected, depending on the distribution characteristics of the fixture selected.

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.



OPEN LOUVERED *suspension units with diffusing side panels minimize glare and give high intensity direct illumination on the equipment displays in this showroom.*

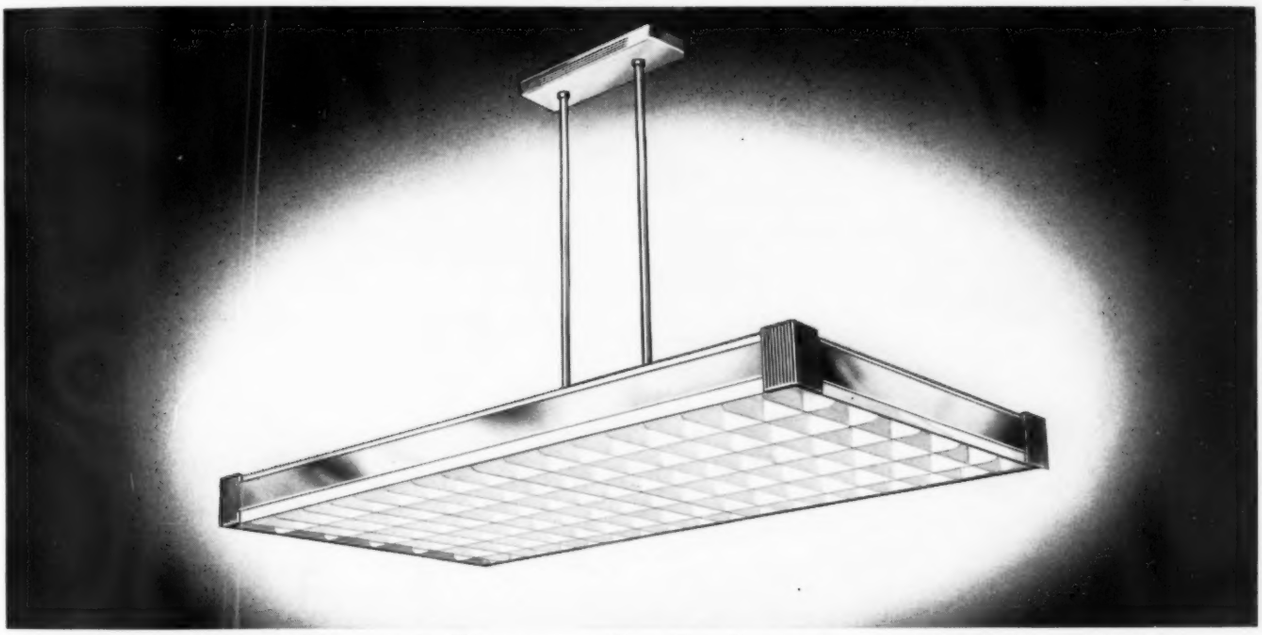


REDIRECT LIGHT *from modified V reflectors on these units combines with direct component to provide evenly distributed illumination on the working plane in this office.*

WAKEFIELD ANNOUNCES

THE ACE

. . . beats 'em all on jobs with poor ceilings and it's "tops" for high intensity downlight



A certified Fleur-O-Lier . . . checked and certified by E. T. L.

Here's a grand card for you to hold in this fluorescent lighting game . . . the new Wakefield ACE. For it beats 'em all on jobs with poor ceilings. And it's the high card that turns the trick when the customer wants high intensity down light.

Because the ACE puts 90% of its light downward. That means more light on counters . . . on displays . . . more light on desks. And it is soft, pleasing light for the lamps in the unit are well shielded; have adequate louvers to give even brightness over the bottom of the unit, providing a "skylight" effect. A small amount of indirect light goes to the ceiling to relieve harsh contrasts.

The ACE's narrow 3-inch reflector section eliminates any bulky appearance in the unit; while its satin cadmium and baked white enamel finish adds greatly to its attractiveness. Maintenance cost is low since all important reflecting surfaces face downward. Lamp replacement is easy; simply lower hinged louvers. Units can be interconnected on factory order to form continuous luminaires. Available in four-lamp and six-lamp units.

And especially helpful to you, the ACE is a Certified Fleur-O-Lier; checked and certified by impartial Electrical Testing Laboratories to standards that assure you and your customers of good lighting performance, dependable operation and satisfactory service.

You're sure to be a winner when you hold the ACE! Write us for full details.

OUR 35th ANNIVERSARY 1906 1941

Wakefield also makes many other fluorescent units for commercial lighting.

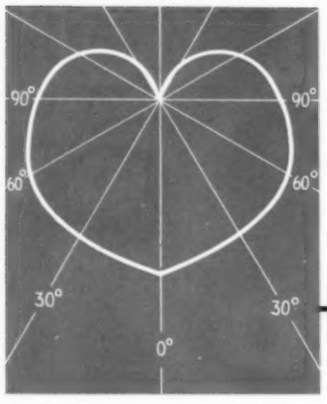
THE F. W. WAKEFIELD BRASS COMPANY

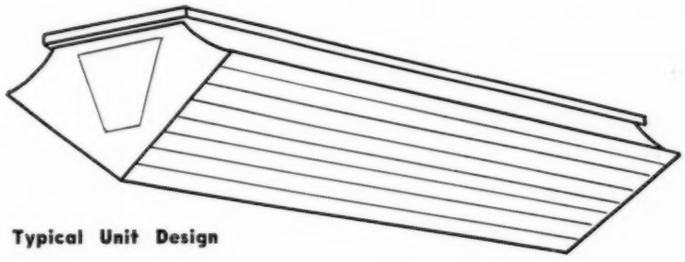
101 Contract Park, Vermilion, Ohio

Fluorescent Commercial Units

Group M . . . SURFACE MOUNTING TYPE

Typical Distribution





Typical Unit Design

RECOMMENDED APPLICATIONS

A METAL pan or housing that attaches to the ceiling, supports the ballast and acts as a wireway for continuous run mounting. Baked enamelled steel is used most often for reflectors, which may be detached for maintenance without disturbing the housing or wiring. Metal or plastic end caps, usually decorative in design, conceal the lampholders and may also hide the normal end-blackening of lamps. Glass or plastic panels are commonly used to insure low brightness and wide light distribution. These are supported by the end-caps as are the louvers which may be used to provide proper shielding. Designed for mounting directly on the ceiling, this type of fixture may accommodate one to six lamps from 15 to 100 watts in size.

For general lighting in all rooms with low ceilings (nine feet or less) or in any room where the width is equal to or greater than four times the ceiling height. Useful under mezzanines, in hallways, in continuous rows over display counters, or in shapes to fit ceiling design.

PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE	AVERAGE MAINTAINED FOOT-CANDLE LEVEL				
LARGE ROOM	AVERAGE ROOM	1–20 Watt*	1–40 Watt*	3–40 Watt*	1–100 Watt*
24	20	13	30	85	60
37	29	9	20	57	40
64	52	4	11	30	22

** 3500° White Lamps.*

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

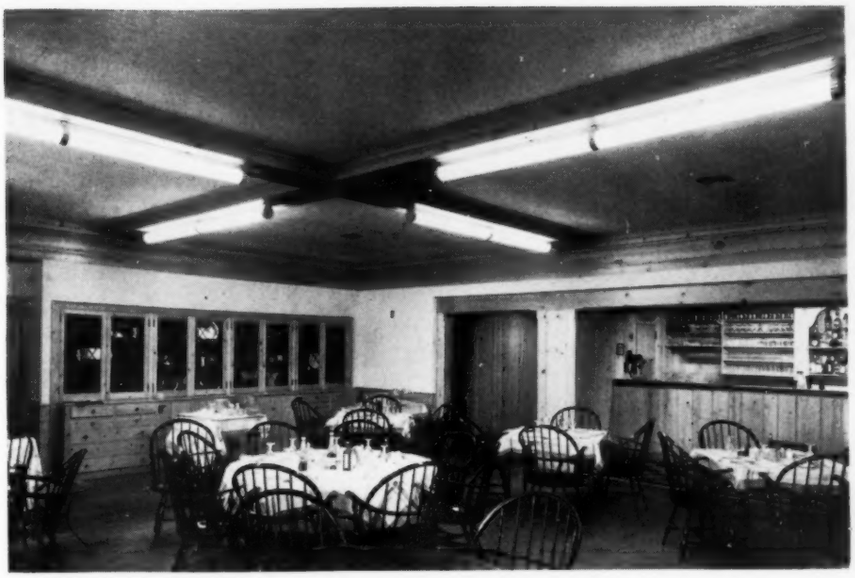
CONTINUOUS ROWS *of surface type fixtures, mounted end-to-end, form four lines of light on the relatively high ceiling of this bank. Working plane intensity is 75 foot-candles.*



LOW CEILING *problem in this office was solved by using snugly-mounted fluorescent units with diffusing glass enclosures. Average illumination is 48 foot-candles.*



EXAMPLES of GOOD LIGHTING



»

SHIELDED FLUORESCENT *units composed of two four-foot fixtures end-to-end, surface mounted on the beams, provides glareless, evenly diffused vertical and horizontal lighting in this restaurant.*



»

DIFFUSING "V" *shaped enclosures on these suspended type four-lamp fluorescent fixtures conceals the lamps and reduces brightness. Resultant intensity, with daylight lamps, is 25 to 30 foot-candles in this men's shop.*

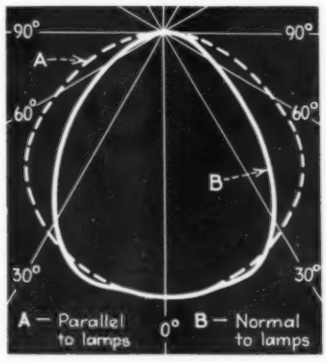


»

ASSEMBLY AND INSPECTION *operations in this industrial plant are performed under an average of 50 foot-candles of fluorescent illumination. Units, mounted 8-ft. above the floor on 7-ft. spacing are 40-watt, two-lamp, open-end type.*

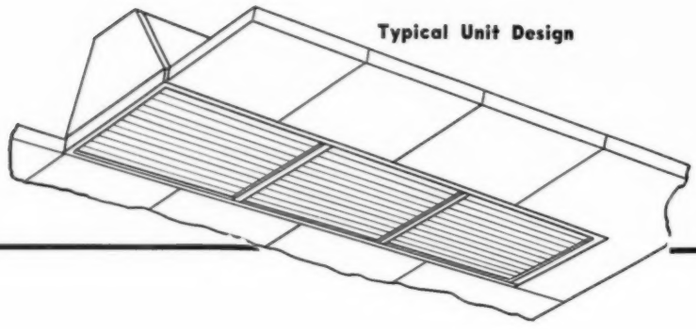
Fluorescent Commercial Units

Group N . . . RECESSED TROFFER TYPE



Typical Distribution

Typical Unit Design



THE recessed troffer type fixtures accommodate one or two rows of 15, 20, 30 or 40 watt or one row of 100 watt fluorescent lamps. Designed for installation flush with the ceiling surface, the fixtures are either equipped with a plaster ring or are so constructed that they may be snapped directly into the tee-bar hangers of an acoustic tile ceiling. Twelve inches in width, to conform with standard tile, the fixtures require about ten inches free space above the ceiling. The reflector which is of baked enamel may be equipped with louvers or glass diffusing panels. In use, the fixture is concealed from view and appears to be a part of the ceiling.

RECOMMENDED APPLICATIONS

For every general lighting purpose in all low ceiling areas and in any room with width equal to or greater than four times the ceiling height. Particularly for installations in acoustic tile ceilings.

PERFORMANCE CHART—Characteristics of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM	AVERAGE ROOM	1–40 Watt	2–40 Watt	1–100 Watt (with louvers)
35	28	30	58	50
27	20	40	75	65
53	42	20	39	35

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

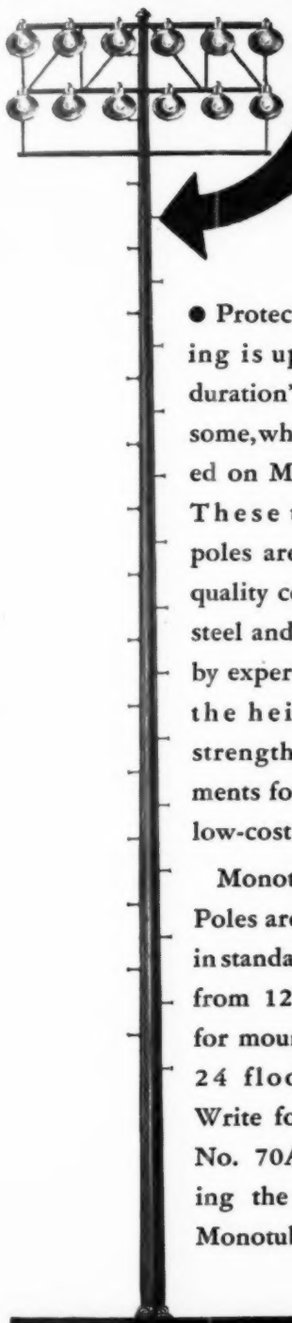
CEILING BLENDED *continuous recessed troffers extend across the width of this long, narrow office. The fixtures appear to be a part of the ceiling.*



TROFFER SECTIONS *of the open recessed type provide evenly distributed light on these desk tops. Troffers are deep enough to conceal bare lamps from normal view.*



PROTECTIVE LIGHTING *STAYS PUT ON* MONOTUBE *POLES*



● Protective lighting is up "for the duration" and then some, when mounted on Monotubes. These tapered poles are made of quality cold rolled steel and designed by experts to meet the height and strength requirements for efficient, low-cost service.

Monotube Steel Poles are available in standard lengths from 12 to 90 ft. for mounting 1 to 24 floodlights. Write for Catalog No. 70A describing the complete Monotube line.

THE UNION METAL MANUFACTURING CO.
CANTON, OHIO

THE NEW WHEELER VAPOR-PROOF FLUORESCENT LIGHTING UNITS



For Use in Locations where Non-Combustible Dusts and Vapors Exist

Wheeler VAPOR-PROOF Fluorescent Units are made for use in food plants, foundries, and similar locations where it is necessary to protect lamps, sockets and reflecting surfaces from moisture, dust, smoke and vapors.

These units are made for use with 40-watt Fluorescent lamps, and are available in two- and three-lamp constructions.

In locations such as food plants where it is desirable to take extra precaution against lamp breakage, it is recommended that units be equipped with safety sheet glass covers for maximum protection.

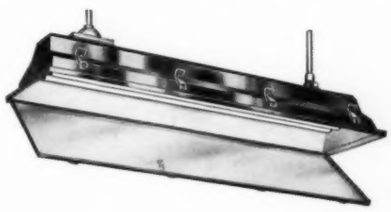
The entire outer body of the reflector, including its closed ends, is enameled in one piece. All sockets and lamp operating equipment are mounted on a wiring channel which is installed through the mouth of the reflector.

The mouth of the reflector has a recessed flange to receive the hinged glass cover which seats against cushioning gaskets to form a moisture and dust-proof seal.

All units are supplied complete with the latest type of ballast equipment employing separate and renewable starter switches. Two-lamp fixtures are supplied with high power factor Tulamp ballasts resulting in an overall power factor above 95% and greatly minimizing any stroboscopic effect. A starting compensator is included in all units.

All units are supplied with hinged suspension fittings which can be swung open upon release of screws, exposing leads for quick and easy splicing. Suspension fittings are tapped for ½" conduit.

Fixtures are furnished *wired*, with leads left for connecting to branch circuit.



HINGED DUSTIGHT GLASS COVER

The Hinged Dustight Glass Cover is readily opened for access to lamps or starter switches by releasing toggle latches. Units can be supplied with 3/16" Double Thick Plain Clear Glass, ¼" Water White Plate Glass, or ¼" Temperod, Clear Safety Plate Glass.

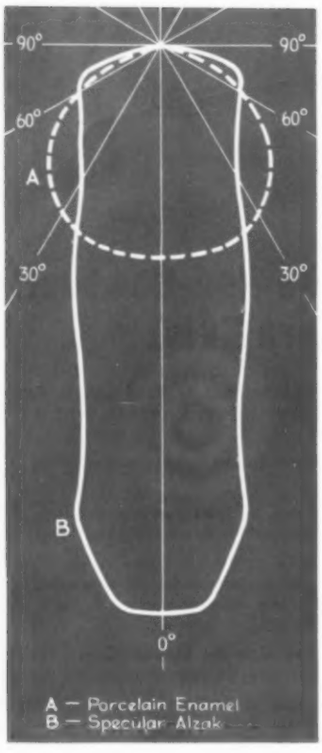
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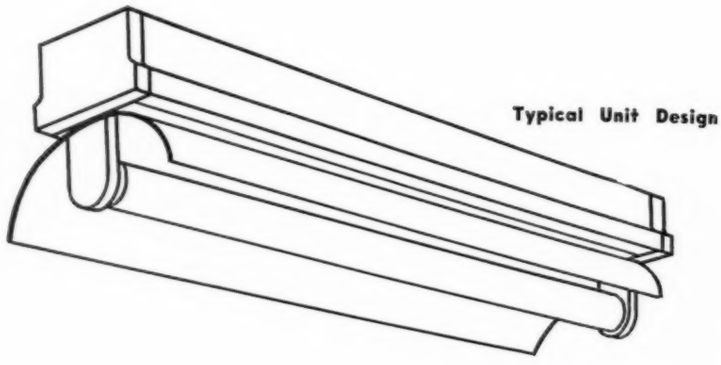
Wheeler **REFLECTOR COMPANY**
275 CONGRESS ST., BOSTON, MASS.
NEW YORK · CLEVELAND · *REPRESENTATIVES IN PRINCIPAL CITIES*

Fluorescent Commercial Units

Group O . . . CONTINUOUS STRIP

Typical Distribution





Typical Unit Design

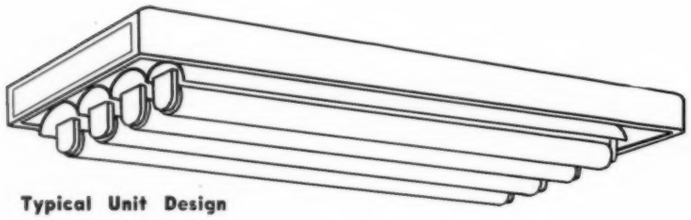
NARROW metal raceway or wiring channel 2-in. by 4-in. in cross section—large enough to contain the necessary ballasts and to support fluorescent lampholders. It is designed in sections to accommodate lamps from 15 to 100 watts. Available with or without reflectors, the sections may be joined end to end to form continuous strips of any desired length.

Larger channels for two to four rows of lamps are available. These may be obtained with channel covers of aluminum or polished steel which serve as reflectors.

RECOMMENDED APPLICATIONS

For built-in lighting, in coves, valances, wall niches, display cases or illuminated signs For luminous decorative elements in architectural design. For artificial skylights. Behind diffusing glass for color matching booths.

Group P . . . SHOW WINDOW UNITS

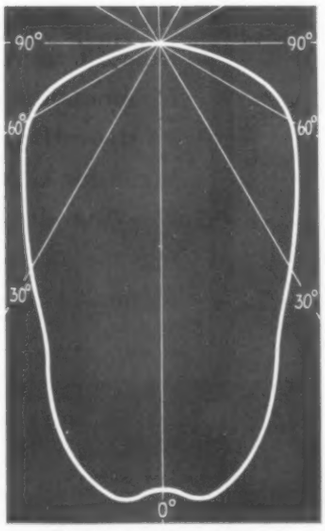


Typical Unit Design

SHALLOW metal pans, supporting two to six lamps from 15 to 100 watts, with individual reflectors or a plane reflecting surface. They may also be mounted end to end. The ballasts and wiring are concealed inside the pan which may be recessed in the ceiling of the window. Or the unit may be suspended behind the window valance.

RECOMMENDED APPLICATIONS

For general lighting in all display windows or large cases where additional accent lighting is available with incandescent spots. Should be mounted well out of the view of the shopper.



Typical Distribution

PROBLEM:

WHERE CAN I GET FLUORESCENT LIGHTING THAT WON'T BE OUT-OF-DATE IN A FEW YEARS?



ANSWER:

Do it Right with

L-I-N-O-L-I-T-E
(Trade Mark)

The trade mark "LINOLITE" identifies Fluorescent equipment which is *Engineered for Performance* by Barkon-Frink, the pioneers in gaseous tube lighting. When you specify LINOLITE for your Fluorescent installation you are assured of the *long-term satisfaction* of a sound investment backed by Frink's *complete* lighting service and 84-year record of experience.

New 24 Page illustrated brochure contains important fluorescent lighting data, photos of typical installations and valuable information on correct types of fixtures. It helps you avoid costly and unfortunate mistakes. Mail the coupon today for your copy.



THE FRINK CORPORATION
Bridge Plaza South, Long Island City, N. Y.
Please send me your new brochure on "The Ultimate in Fluorescent Lighting." EC-10

NAME .....
ADDRESS .....
CITY .....



Lamps	Starters	Contacts
6 in., 4 watts 9 in., 6 watts 12 in., 8 watts	FS-5	2
18 in. T-8, 15 watts 24 in. T-12, 20 watts	FS-2	2
36 in. T-8, 30 watts 48 in. T-12, 40 watts	FS-4	2
36 in. T-17, 65 watts	FS-74	4
60 in. T-17, 100 watts	FS-64	4
60 in. T-17, 100 watts	FS-6*	2

*For replacement in 2-contact starter sockets

Customers for whom you've installed fluorescent fixtures will need starters for replacement. Others using fluorescent lighting need starters replaced. Get this business with G-E starters. They are designed by MAZDA lamp engineers and have correct operating characteristics to provide normal fluorescent lamp life and performance.

The G-E starter line includes starters for fluorescent lamps of 4 to 100 watts, 6 inches to 60 inches in length. Some of these starters are 2-contact; others are 4-contact.

For further information see the nearest G-E Merchandise Distributor or write to Section D-180, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.

GENERAL ELECTRIC

OUTSTANDING LIGHTING INSTALLATIONS



CLOSED END. *four lamp fluorescent reflectors at a 22-ft., 3-in. mounting height provide an "in service" intensity of 20 to 25 foot-candles in this large sheet metal mill. An area of 24,000 sq. ft. is covered by 160 units.*

»



MACHINE SHOP *lighting in this plant is approximately 20 foot-candles in intensity. Four-foot fluorescent units are mounted 11-ft., 6-in. above the floor and are on 10-ft. by 12-ft. spacings.*

«



COMBINATION *of incandescent and mercury vapor fixtures on staggered spacing is employed to provide high intensity lighting in this building which houses sheet metal stock.*

»



GRINDING DEPARTMENT *in this plant is evenly lighted by high intensity illumination from lines of open-end RLM type fluorescent fixtures. Units are ceiling suspended by conduit stems directly over machines.*

«

Levolier the *Dependable Switch for* **FLUORESCENT Lighting Control**



Designed to control either 110-volt or 200-volt installations, and to operate from the fixture pan or canopy, Levolier Switches give you maximum efficiency on Fluorescent Units. Small and compact, these Levolier Switches carry the load without pitting, arcing or heating, making for long, dependable service.



No. 276

CATALOG REFERENCES

No. 41—S.P., 6 Amp., 125 V.—3 Amp., 250
No. 1010—S.P., 10 Amp., 125 V.—5 Amp., 250
No. 276—D.P., 6 Amp., 125 V.—3 Amp., 250
*No. 1020—
Two-Circuit 10 Amp., 125 V.—5 Amp., 250
*Control: 2—3—All—Off.

Defense Projects Use McGILL Products

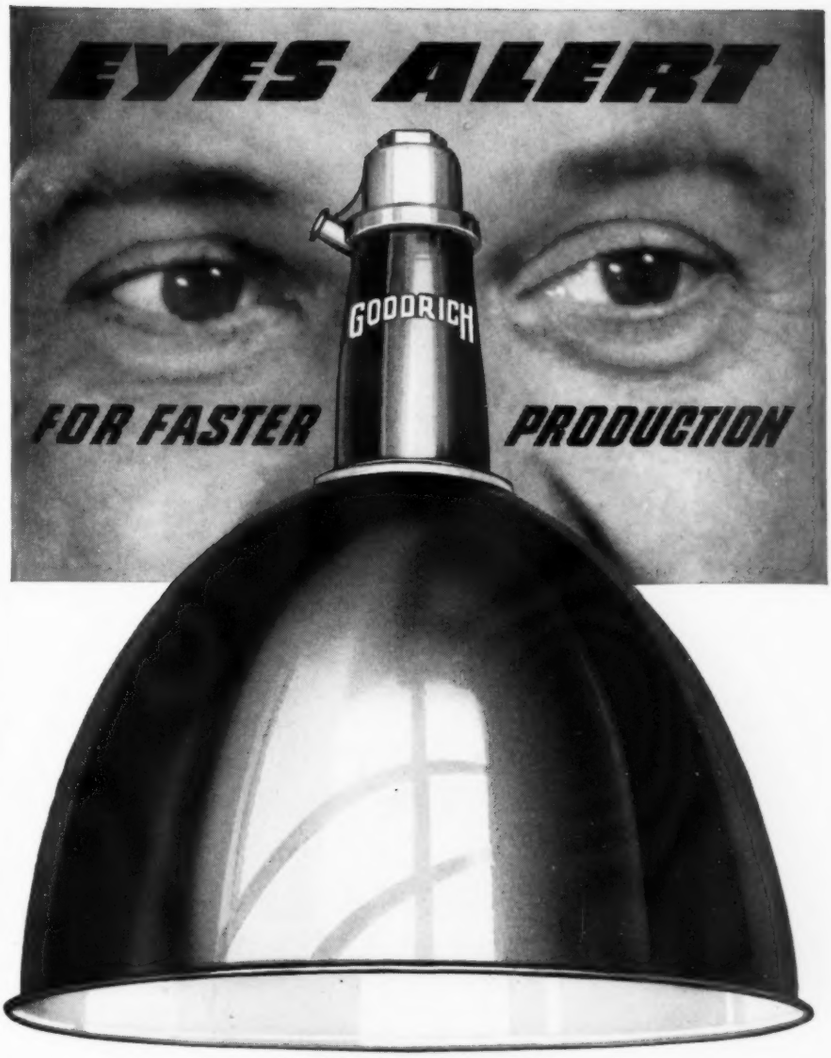


No. 41

See your Electrical Wholesaler for detailed information or write direct to —

McGILL MANUFACTURING CO.
Electrical Division
Valparaiso, Indiana

McGILL



HIGH BAY REFLECTOR

HERE'S the fixture that's setting new high levels of general illumination in many vital defense plants—providing the better vision that saves time and speeds up production.

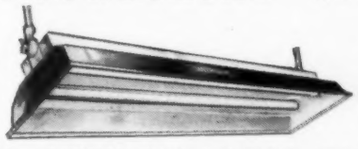
Finished in permanent porcelain enamel, this new Goodrich High Mounting Fixture gives good diffusion, minimizes glare, softens shadows and spreads a uniform high intensity of light over a large working area.

Available in several styles; shown above with Goodrich Diskonect Hood for easy installation and servicing.

Catalog sheets on request.

GOODRICH
INDUSTRIAL LIGHTING

RLM



GOODRICH FLUORESCENT FIXTURES are offered in a variety of styles and sizes for varying requirements. Write for catalog sheets on the complete line.

SOLD ONLY THROUGH ELECTRICAL WHOLESALERS

GOODRICH
ELECTRIC COMPANY
OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES AND FACTORY: 4602 BELLE PLAINE AVENUE, CHICAGO, ILL.

INCANDESCENT
Commercial Units

LIGHTING EQUIPMENT plays an important part in the general impression created by any commercial interior. Its design must be attractive and it must enhance the appearance of the other decorative elements in the room. In creating an attractive interior, however, the illumination characteristics of the lighting equipment must not be forgotten or subordinated. The available units lend themselves to classification as follows:

GROUP Q . . . . **Direct Lighting Units** are designed for sales areas where the merchandise must attract attention. Controlled distribution with louvers or lens plates to reduce the unit brightness is characteristic of this group. It allows high selling levels on displays with sufficient "spill" into the aisles for comfortable shopping.

GROUP R . . . . **Indirect Lighting Units,** that send all the light to the ceiling for reflection to the working plane, provide the most uniform levels of illumination. The ceiling becomes in reality a secondary light source. Maintenance problems with this type of unit are naturally difficult and laxity results in lowered efficiencies. This type should never be used where levels above 40 foot-candles are desired.

GROUP S . . . . **Semi-Direct and Semi-Indirect Units** include the wide variety of luminous bowl fixtures. These provide well-distributed illumination on both the horizontal and vertical planes. They have been used successfully in both offices and stores. The brightness in the field of view must be guarded against with this type of unit.

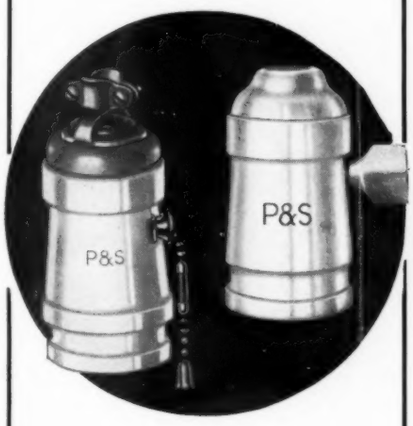
GROUP T . . . . **Recessed Units for Direct Lighting** are available in several designs. They come with lens plates or louvers to give uniform illumination in low ceiling installations. Also, there are concentrating "down lights" for high ceiling installations or the "high lighting" of displays. These recessed units add variety and may be used in combination with other units to achieve unusual lighting effects.

● When selecting equipment, consider design, construction, illumination characteristics and the impression to be created by the installation. Careful planning will insure satisfaction.

P&S

WIRING DEVICES

for NATIONAL DEFENSE



P&S Porcelain Wiring Devices are being used in cantonments throughout the country.

Dependable Performance— Essential to the National Defense Program.

Use P&S Products on your Defense jobs.

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Sold Through Electrical Wholesalers

Pass & Seymour, Inc.
SYRACUSE, N. Y.

QUAD

LIGHTING UNITS ALL HAVE CORRECT BASIC DESIGN *and* CONSTRUCTION FEATURES

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QUAD

QUADRANGLE RLM

★ When you sell QUAD Lighting Units you sell products scientifically designed to give your customers the highest lighting efficiency. Full line of industrial and floodlighting equipment — incandescent — fluorescent — mercury vapor. It's the line that stays popular.



NO. 1184-M RLM THREADED DOME REFLECTOR

QUADRANGLE MFG. COMPANY
Mfgrs. of Incandescent and Fluorescent Lighting Equipment
32 SO. PEORIA ST. CHICAGO, ILL.

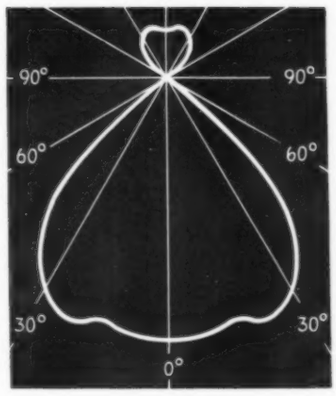
Incandescent Commercial Units

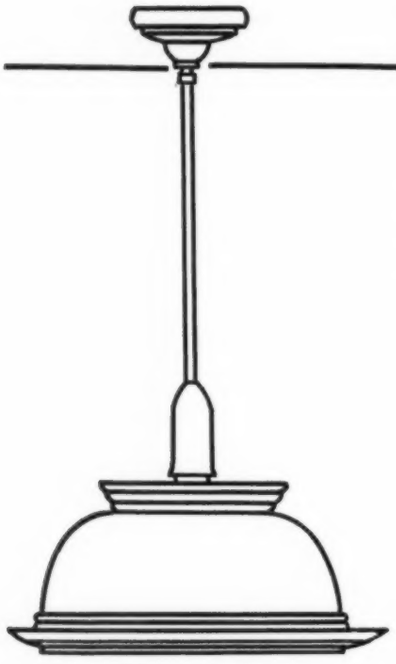
Group Q . . . DIRECT LIGHTING TYPE

THESE fixtures direct nearly all light downward, sending only enough up to the ceiling to reduce harsh contrasts. Opal and prismatic glass globes as well as metal reflector models are available for use with lamps from 75 to 500 watts.

This type may be suspended from the ceiling by a section of metal tubing or chain or may be attached directly to its ceiling canopy. The globe or reflector is attached to the metal housing containing the lamp socket by three or four thumb screws or patented fasteners and may be removed conveniently for maintenance. For lower brightness, metal or plastic louvers are used with the reflector models.

Typical Distribution





Typical Unit Design

RECOMMENDED APPLICATIONS

With a narrow distribution and downward concentration of light, direct lighting fixtures are particularly fine for merchandising or display areas, where the merchandise or objects on display should be the brightest spot in view. For general lighting, they should not be spaced wider than their mounting height in order to avoid uneven distribution.

PERFORMANCE CHART—Characteristic of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM	AVERAGE ROOM	100 Watt	300 Watt	500 Watt
35	26	15	55	100
54	42	10	36	65
100	71	7	19	35

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

LOBBIES AND READING *rooms, in addition to decorative effects, need a good downward concentration of light on the reading level. Here, surface-mounted and recessed direct lighting units are used.*



MERCHANDISE EMPHASIS *on store counters aids the customer to make a quick selection. Suspension fixtures with major downward light distribution are mounted directly over the counters.*



LIGHTING— IN *EVERY* ISSUE!

There are 30 full pages of editorial material on lighting in this Annual Lighting Issue of Electrical Contracting.

But———————

That's only *part* of Electrical Contracting's lighting service to readers.

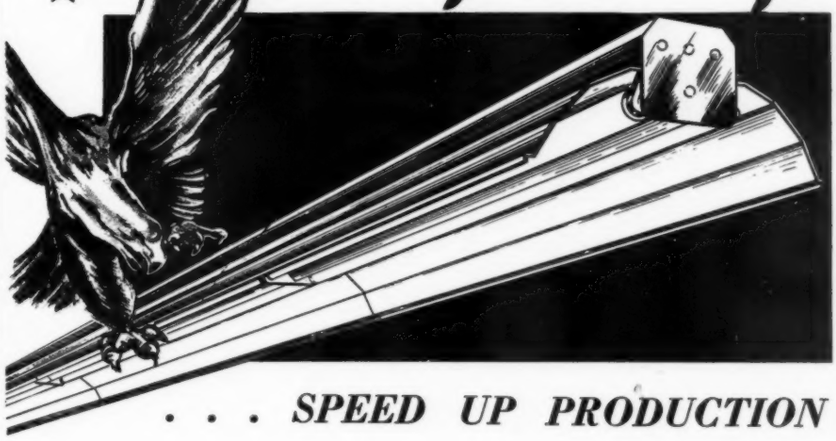
In the preceding eleven issues your editors have presented dozens of pages of lighting material . . . up-to-the-minute dope on latest methods and equipment, the kind of stuff which helps with *today's* jobs.

Month in and month out, Electrical Contracting presents the most useful data on lighting we can find.

And, of course, lighting is but *one* of the many subjects covered by E. C. Departments. Articles on every phase of the contractor's job make this *the magazine of the electrical construction industry.*

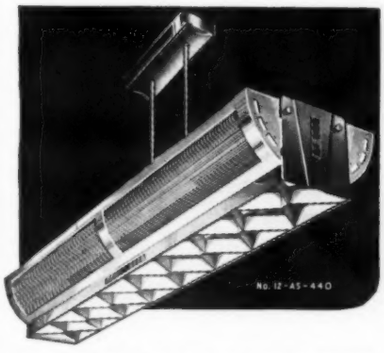
Reason enough why it pays to read *every* issue of ELECTRICAL CONTRACTING

★ ★ ★ DEFENSE *Lighting*



. . . *SPEED UP PRODUCTION*

COMMERCIAL LUMINARIES



No. 12AS4-40 Four four 40 watt fluorescent lamps



18AS-2-40 for 40 watt fluorescent lamps

18AS-2-100 for two 100 watt fluorescent lamps

★ With these proven efficient and high quality fluorescent industrial units. Obtain Maximum Productive capacity through higher lighting levels that cut down employee fatigue and enable utilization of all dark space wasted by improper lighting. Abundant cool, glareless fluorescent light the closest approach to north light—gives you daylight on every shift and assures equal efficiency around the clock. High quality workmanship is obtained by enabling employees to see easier and quicker.... A necessity for efficient production.

★ Fluorescent Industrial unit, illustrated above, may be installed individually or in continuous runs and is obtainable in a one—two or three lamp unit. For either 40 watt or 100 watt fluorescent lamps. Wired complete and underwriter's approved. Wiring may be exposed at any time quickly and easily without dismembering the fixture due to "Lighting Products's Patent One Man Installation" feature.

★ Fixture exterior finished in "Klasium Luminex," similar to an aluminum finish. The Reflector is finished in "Klasium White" Lighting Products' own, specially compound enamel which gives *you more light per watt* due to its high reflectivity and is readily washable, corrosion resistant and will not discolor, crack or chip.

★ **Without obligation, write today for detailed information about these highly efficient—simple to install—fluorescent luminaires — Members of the Fleur-O-Lier—If its Fluorescent its**

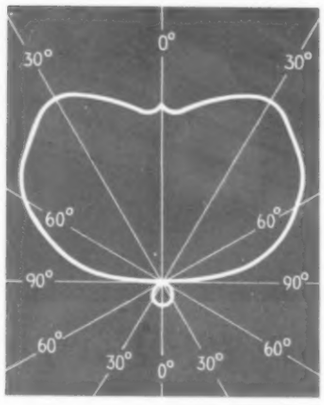
LIGHTING PRODUCTS INC.

HIGHLAND PARK — ILLINOIS — U. S. A.

Incandescent Commercial Units

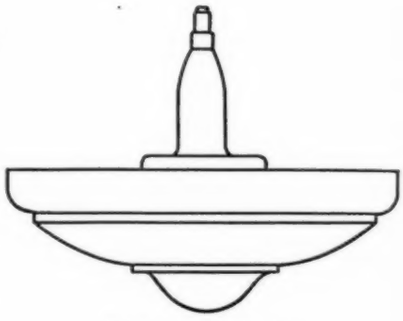
Group R . . . INDIRECT LIGHTING TYPE

Typical Distribution



SHALLOW metal, glass, and plastic bowls, as well as combinations of metal and either glass or plastic, reflect most of the available light toward the ceiling. When this type of fixture is installed, the ceiling becomes a diffuse source and the distribution of light is uniform and almost shadowless.

Inherently inefficient, the indirect type has the advantages of low brightness and inconspicuous appearance, contrasting only slightly with the bright ceiling. Indirect lighting fixtures must be suspended two to six feet below it. Common types are suspended by means of a single metal stem. It is to be used with 300, 500 and 1,000 watt lamps.



Typical Unit Design

RECOMMENDED APPLICATIONS

For general high quality illumination where maintenance is good and power rates low. Excellent for reading and other moderate visual tasks.

PERFORMANCE CHART—Characteristics of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM	AVERAGE ROOM	300 Watt	500 Watt	1000 Watt
64	56	22	40	
100	72	15	25	55
200	144	7	12	27

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.

INDIRECT WALL *units, supplemented by totally indirect suspended ceiling fixtures provide a comfortable, soft illumination in this office.*



GLARELESS LIGHT *from suspended totally indirect incandescent fixtures gives a comfortable and pleasant illumination intensity for general office work.*



BADGER

Synchronous

ELECTRIC TIME SWITCHES



CONTRACTORS LIKE THEM BECAUSE:
they are dependable and easy to install

USERS LIKE THEM BECAUSE:
of economical operation and low cost

The Badger line of Time Switches is always in demand by Contractors who want dependability, accuracy, and the right type for a specific need. They know from experience that this is the line that gives them successful, profitable installations. They know when they install Badger Synchronous Electric Time Switches for their customers they are giving them complete satisfaction—accurate timing, economical operation, dependable service. You can't go wrong on Badger. Write for more particulars or see your Wholesaler.

RELIANCE AUTOMATIC LIGHTING COMPANY
1937 MEAD STREET RACINE, WISCONSIN





TWO INSTRUMENTS *EVERY* LABORATORY NEEDS

The Acme Insulation Breakdown tester not only indicates grounds, shorts or opens but provides for the checking of circuits at approved voltage standards (double the rated voltage plus 1000). Manually adjusted with secondary voltage rating of 500, 1000, 1250, 1500, 1750, 2000 and 2500 volts. Portable and designed with every safety factor.

The Acme Voltrol (made in portable and panel mounting types) gives complete manual control over line voltage in stepless range from 0 to 135 volts. Not a resistance type regulator, output voltage is independent of load.

Acme also manufactures Luminous Tube Transformers, Fluorescent Lamp Ballasts, Radio and Television Transformers, Mercury Vapor Lighting Transformers, Air-Cooled Power Transformers.

THE ACME ELECTRIC & MFG. CO.
36 Water Street • Cuba, N. Y.

Acme ACME Electric
TRANSFORMERS

OAMCO REFLECTORS

FLUORESCENTS



RLM

STANDARD 2-LIGHT
For 40 or 100
Watt Lamps

. . . . . EACH SIZE HAS A PARTICULAR NEED TO FILL . . . WE CAN SUPPLY THE PROPER TYPE . . . . . .

OAMCO can supply the proper unit—either fluorescent or incandescent to give highest lighting efficiency at minimum installation and maintenance cost. Contractors endorse OAMCO fixtures because they can install them and forget them — Complete catalogs describe and illustrate our line No. 101 Incandescent and No. 99 Fluorescent—send for them.

OAMCO REFLECTORS

INCANDESCENTS



SIGN REFLECTOR



WEATHERPROOF BRACKET FIXTURE



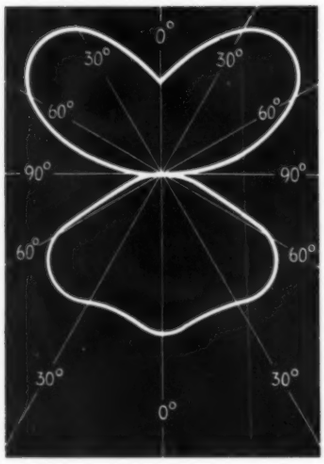
RLM SOCKET REFLECTORS

OVERBAGH & AYRES MFG. CO.
Charter Member, **RLM STANDARDS INSTITUTE**
411 S. CLINTON ST. CHICAGO, ILL.

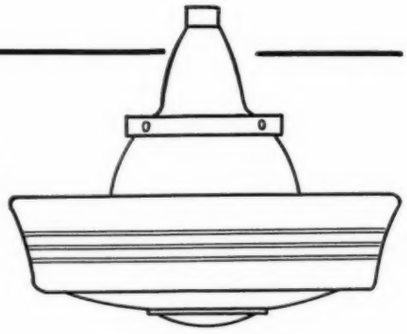
Incandescent Commercial Units

Group S . . . SEMI { Direct / Indirect } TYPES

Typical Distribution



group insures uniform illumination on the working plane with well lighted walls and ceilings. This type is likely to have a higher brightness than the direct or indirect types. With the large number of fixtures available, it is possible to obtain almost any desirable distribution and designs which complement any interior.



Typical Unit Design

RECOMMENDED APPLICATIONS

For general lighting where average light is required. Because of their higher brightness care should be taken to mount these fixtures out of the field of view, whenever prolonged visual tasks are encountered.

GLASS enclosing globes and shallow bowls of high transmission diffusing glass or plastic supported from the ceiling by stem or chain. They distribute light almost equally up and down. A metal housing contains a lamp socket for lamps from 75 to 500 watts in size, and supports for the bowl or globe. The widespread distribution characteristic of this

PERFORMANCE CHART—Characteristics of the Group†

AREA (Square feet) PER FIXTURE		AVERAGE MAINTAINED FOOT-CANDLE LEVEL		
LARGE ROOM	AVERAGE ROOM	200 Watt	500 Watt	1000 Watt
64	45	17	46	
100	70	11	30	65
200	140		15	33

Note: Because of the wide variation in distribution characteristics, considerable deviations from these average figures may be expected.

† The figures given above suggest maintained results under good conditions in typical installations. They are not design recommendations and should not be used as such. When planning layouts with the selected fixture, actual figures should be obtained from the manufacturer's catalog.



CEILING TYPE *fixtures with diffusing lenses in the enclosing globes provided uniform semi-direct illumination in this small office*

LUMINOUS BOWL *semi-direct incandescent units in this office give a uniformly distributed light.*



The Ads Are Interesting, too!

● You'll find that the thirty editorial pages on lighting in this issue are *useful.* Equally helpful are the many articles which have appeared in past issues.

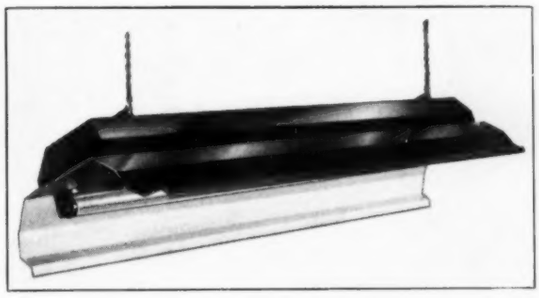
How-to-do-it articles . . . latest methods on lighting . . . new wrinkles . . . written by experts.

The advertisements, too, are a valuable part of this magazine. You owe it to yourself to read them because they tell you the full story about the products which you are bound to need for job after job. You will find that our advertisers are serving you as well as themselves.

Be sure to read the ads! Not only on lighting, but for all the hundreds of products you use every day!

• • *LEADER announces the best and newest in Fluorescent Fixtures for "AT ONCE" delivery!*

Leader IUO-240 — illustrated—an efficient high powered 2 lamp 40 watt fixture — assures low maintenance cost — low installation cost. 95% power factor correction and efficient engineering eliminates stroboscopic effect. Ideal for factories store windows, laboratories, drafting rooms, etc.



Six Big Features

- Low Cost
- High Efficiency Illumination
- Porcelain Enameled
- Easily Installed
- Adjustable Hanging Angles
- High Power Factor Corrected

Approved by Underwriters Laboratories, Inc.

★ The IUO-240 is but one of the extensive advanced LEADER line of commercial and industrial fixtures.

NO OTHER LINE HAS AS MANY SALES FEATURES FOR YOU TO CAPITALIZE ON! Write today for information on the dependable, "step ahead" LEADER line.

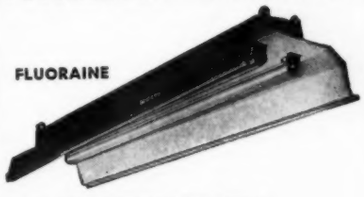




LEADER
ELECTRIC MFG. CORP.
832-36 W. Superior St.
Chicago, Ill.



MULTI
FLUORESCENT REFLECTORS

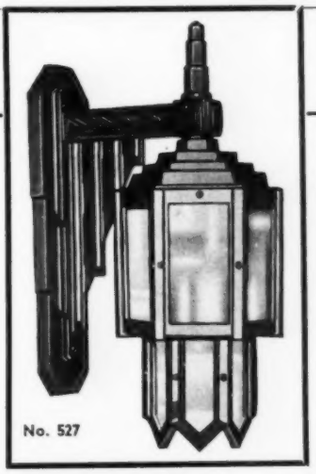


TO MEET EXACTING REQUIREMENTS FOR GENERAL OR LOCALIZED ILLUMINATION . . .

MULTI fixtures assure good lighting over longest periods of time, at more reasonable cost. They are modern, low in first cost, easy to clean, and economical to maintain.

Send for complete catalog

MULTI
ELECTRICAL MANUFACTURING CO.
1840 W. 14th ST., CHICAGO, ILL.



HERWIG
manufacturers of
OUTDOOR LIGHTING FIXTURES
for over 30 years—
— cast iron — bronze — aluminum —

ELECTRICAL CONTRACTORS find HERWIG FIXTURES appeal to the trade because:

- They are suitable for all kinds of buildings—"A FIXTURE FOR EVERY OUTDOOR PURPOSE".
- The United States Government and leading architects have been specifying them for years.

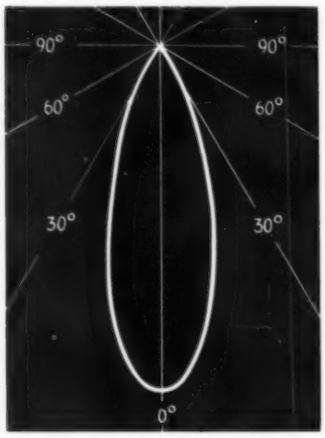
Write now for catalog 40 and new supplement with revised prices, showing the most complete line of outdoor lighting fixtures made today.

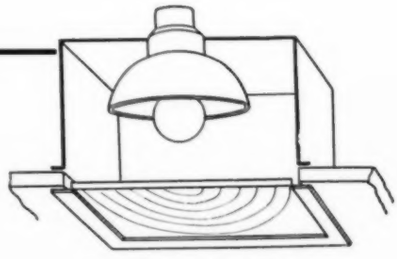
The HERWIG Company
1765 Sedgwick St.
CHICAGO ILLINOIS

Incandescent Commercial Units

Group T . . . RECESSED TYPES

Typical Distribution





Typical Unit Design

A WIDE variety of fixtures are available which fit this description, including the down-light, the lensplate unit, and the built-in coffer. Designed to be permanently installed as part of the architectural design, their installations call for the most carefully engineered planning.

Lensplates, individually mounted or as sections of large area diffusing panels accommodate many lamp sizes, allowing wide variation in illumination levels. Where good merchandising demands the lowest possible fixture brightness, deep egg-crate or concentric circular louvers should be used.

RECOMMENDED APPLICATIONS

In low ceiling areas where space does not allow suspended fixtures (9 feet or lower). For accent lighting in combination with adequate general lighting systems. In high ceiling areas where general lighting does not place high enough brightness on the merchandise.



SPEEDIER SALES *are made in this well lighted shoe store. Recessed down-lighting blends with the interior design and provides high intensity accent illumination on the merchandise and customer.*



INCREASED EFFICIENCY *in this office is attributed to the high intensity down-lighting on the working plane. Recessed ceiling units provide the working light while indirect wall units light the ceiling. Low areas use totally indirect suspension units.*

FOR EXTRA SERVICE AND SAFETY



. . . use Bryant Weatherproof Lampholders

YOU want dependable temporary lighting on "tight-schedule" construction projects, on seasonal outdoor decorating jobs, and on emergency installations. That's when *extra* service and safety count most. So write it down as a hard-and-fast rule to use Bryant Weatherproof Lampholders on every job. Made of a special, tough molded material, these rugged, abuse-resisting lampholders can take it and come back for more, regardless of weather conditions.

Your Bryant Catalog lists the complete line of bakelite, composition and porcelain weatherproof lampholders for all outdoor lighting requirements. Write us for latest catalog pages and prices. The Bryant Electric Company, Bridgeport, Connecticut.

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Sold Through Electrical Wholesalers Nationally

BRYANT

SUPERIOR WIRING DEVICES

Every outlet deserves a Bryant device

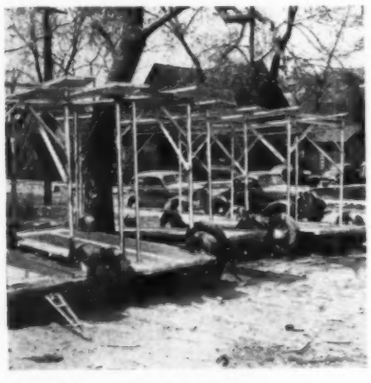
WIRING Methods

ROLLING SCAFFOLD

Auto frames and welded super structure were used to make a group of rolling scaffolds by the Harlan Electric Company of Detroit.

The scaffolds provide a working platform adjustable from 8- to 14-feet above the floor. For handling heavy conduits and busbar assemblies in industrial plants the platform is provided with a pipe and pulley boom operated from a winch below.

Large balloon tires and roller bearings allow the heavy platforms to be wheeled around and over minor debris and rough floors by one man.



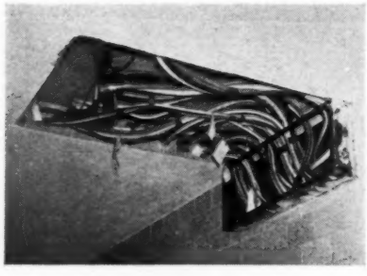
***ROLLING SCAFFOLDS** are adjustable to 14 feet and move easily over minor floor obstructions on balloon tires.*

The lower platform provides a clean working space for materials, power drives and welders.

Pipe supports and bracing are designed for many times the normal load to provide a wide margin of safety.

OFFSET PULL BOX

An offset pull box was used by Harry Alexander, Inc., electrical contractors of Washington, D. C., to carry electrical circuits from a switchboard room to a trucking corridor in the terminal building at the new Washington National Airport.



***CIRCUITS OFFSET** dropped beams in this terminal building corridor through an L-shaped metal pull box with removable blank covers. Upper part of box is flush with ceiling line.*

The main portion of the box is mounted flush in the corridor ceiling while its L-shaped component extends slightly out from the vertical wall line and offsets a dropped beam and ceiling slab. A steel bar across the width of the box at the 90 degree intersection helps to hold the conductors and acts as a mounting plate for the vertical screw cover. The flush part is also enclosed by a removable metal screw cover to provide access at all times.

TEMPLATE FOR MOUNTING FLUORESCENT UNITS

During a recent modernization of department store lighting, the Morganstern Electric Company, electrical contractors of Pittsburgh, Pa., were called on to replace existing incandescent fixtures with new fluorescent units with the back of the units mounted flat to the ceiling.

To expedite the changeover and assure a minimum shutdown of each fixture replaced, the contractor used a fibre template which was an exact duplicate of the bed plate of the fluorescent unit, including all mounting holes. The template had a strip cut out and an opening in the center so it could be slid over the existing fixture stem and canopy for accurate positioning and alignment on the ceiling. The mounting holes were then marked and drilled without disturbing the old unit.

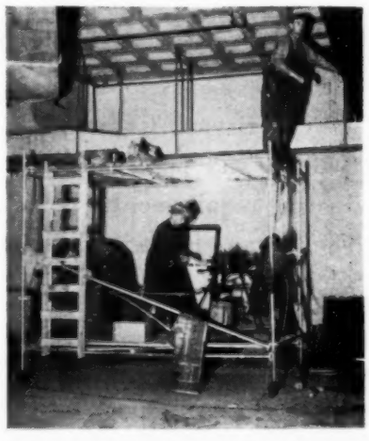
Once all the holes were drilled, it only took about a half hour or so to disconnect the existing fixture and mount and connect the new fluorescent unit. By using several of these templates, rapid progress could be made on each floor and all was ready for mounting the new units. No temporary wiring or lighting was necessary.

The new fluorescent units, which consisted of four 40-watt lamps, two 15-watt end lamps and a totally enclosed hinged glass cover, weighed approximately 75 pounds each and were mounted to the ceiling by six ¼-inch toggle bolts. Ground connections were made to the existing outlet box in the ceiling.

ROLLING WORK SHOP

The Hixon Electric Co., electrical contractors and engineers of Boston, Mass., used a veritable rolling work shop while making the electrical installation in the New England Mutual Life Insurance Building in that city. It is rapidly becoming common practice for contractors to employ rolling scaffolds to mount conduit and install fixtures. But the Hixon Company went one step further and put a floor on their scaffold, placed a tool box and some power equipment on it, installed an electric light—and then went to town on the job.

The rolling scaffold is constructed of 1¼-inch conduit, is 10-feet long, 5-feet wide and 8-feet high. Each upright support is mounted on a caster. Two



***ROLLING ALONG** on a mobile workshop, this three-man crew makes fast time in mounting conduit to the ceiling of an office building. Tools and power threader are always with the mechanics who do all the work on the scaffold.*

FAST, EASY INSTALLATIONS *with* O.Z. *Power Connectors*



The entire O.Z. Power Connector line is designed for quick, simple installation under any conditions. Bolt Heads recessed into the body permit tightening of bolts with a single wrench. Compactness of unit reduces to minimum the difficulty of working in cramped quarters with limited working space.

Other vital factors in O.Z. Power Connectors are high conductivity, maximum corrosion resistance, accurate machining, and sound, solid castings, and special alloys to assure a high degree of mechanical strength.

The experience and recommendations of leading utility and industrial engineers plus extensive research in laboratory and in field by O.Z. Engineers made possible the advanced design features found only in O.Z. products. There is a type for every job.

THE O.Z. "Tell All" Bulletin 103 is a valuable guide book for any contractor working on industrial and utility installations. Write now for your copy — complete with binder.

O.Z. ELECTRICAL MFG. COMPANY

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850

AN OPEN LETTER

To ROEBLING *Customers and Prospects*

Regarding Shipments...



In common with practically all manufacturers whose products are vital to Defense, Roebling is faced with a situation without precedent.

Despite our best efforts—the expansion of our working force—the installation of new machinery—and operation on a 24-hour basis—we find it impossible to keep up with the demand for Roebling electrical wires and cables.

We want you to know, however, that we keenly appreciate your problem. As a buyer, ourselves, we know how serious and irritating shipping delays can be at a time such as this.

Unfortunately, the pressure is increasing instead of decreasing. But we are alert to every opportunity to effect improvements. And you can rest assured that no stone will be left unturned by Roebling in its efforts to meet your needs.

ROEBLING 1841 1941 100th ANNIVERSARY

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY

ROEBLING
ELECTRICAL
WIRES AND CABLES

[FROM PAGE 82]

diagonal pieces of conduit brace the long side spans of the scaffold, which is easily moved from one floor to the other by simply removing the four 5-foot pieces of conduit forming the ends of the scaffold. All connections are made with pipe clamps. It has two platforms, the lower one, which contains a large tool box and a power machine for cutting and threading conduit, is used as a work shop and the upper one is used by the mechanics mounting the conduit and equipment to the ceiling. A light mounted under the top platform facilitates reading the plans and making accurate measurements. A long extension cord supplies current to both the lamp and the power drive. A stationary ladder clamped to one side of the scaffold provides easy access to the top platform.

A three-man crew normally works on the scaffold, one on the lower platform cutting and threading the conduit and two on the top platform installing it. When it is necessary to move on, the mechanic on the bottom pushes the scaffold to a more advantageous position. When installing long conduit spans, a second platform is used, either parallel or tandem to this one, with a second crew working from it.

The efficiency of the field crew is increased considerably by the use of this unique scaffold. The equipment follows the crew throughout the job. The men on top take the measurements, call them below, the other mechanic makes up the conduit, hands it up and it is installed. Lost time is cut to a minimum.

DUST-TIGHT CAPACITORS

The installation of 42 Westinghouse dust-tight capacitors, each rated at 10 kva., raised the power factor at Drayton Mills, textile manufacturers of Spartanburg, South Carolina, from 70 to 87 per cent.

The capacitors are allocated in 14 separate banks of three units each and are connected to feeders in the weaving section of the mill. Twelve of the banks are connected to circuits carrying a total of 120 $\frac{1}{2}$- and $\frac{3}{4}$-hp., 55-volt loom motors. The other two banks are on circuits connected to 60 one-horsepower loom motors.

Each bank of three units is mounted underneath the floor of the weave room. An angle and flat iron framework,



Many of your present sources of business have a real need for Automatic Electric intercommunicating systems. Private telephones are finding an ever-increasing acceptance in homes, small factories and shops, garages, stores, schools, hospitals, etc.

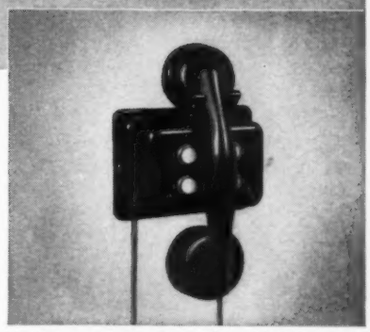
You can make extra sales and extra money for yourself in this market. Supplying your customers with the private telephones they want fits right in with the business you do every day. In addition to selling the equipment, the labor and material you supply add to your profits.

Ask your electrical wholesaler about the Automatic Electric line, today. If he cannot give you the information you need to get into this profitable business, write us direct! There is no obligation.

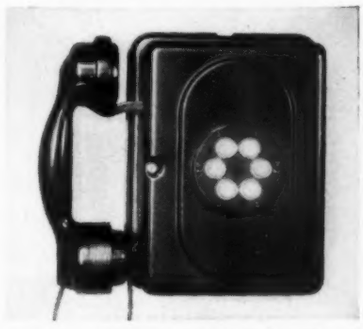
These systems are designed for private service. They are not intended to be connected with the public telephone system.



Your wholesaler should have this display carton. Ask to see it. Find out how easy it is to install the Idealfone.



Idealfones—*Wall type with molded handsets. Offered with one or five buttons for common talking service up to ten stations.*



Intercoms—*Supplied in both desk and wall styles—with molded plastic handsets. Common talking systems of two to eleven stations.*



P-A-X's—*Automatic Interior Telephone Systems. Provide dial service and secret connections for from ten stations up. Telephones in a variety of types.*

AUTOMATIC AE CO ELECTRIC

PRIVATE INTERIOR TELEPHONE SYSTEMS

Distributed by: AMERICAN AUTOMATIC ELECTRIC SALES COMPANY, 1033 West Van Buren Street, Chicago, Illinois

Sales and Service Offices in Principal Cities • In Canada: Canadian Telephones & Supplies Limited, Toronto

should old

acquaintance

be-e forgot



Even under the pressure of National Defense work, we are making every effort to maintain our civilian contacts and to supply old friends whose patronage we have enjoyed through the years. Naturally the government comes first. Delivery dates to civilians are often long and uncertain. We are making a conscientious effort, however, to serve you and will give your inquiries the best attention within our means.

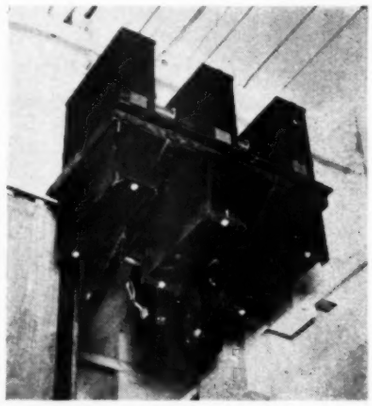
WARD LEONARD ELECTRIC COMPANY
28 South Street, Mount Vernon, N. Y.

WARD LEONARD
relays • resistors • rheostats
ELECTRIC CONTROL DEVICES SINCE 1892

WIRING Methods

[FROM PAGE 84]

mounted to the steel girder, supports the units which are connected together with close nipples. The disconnect



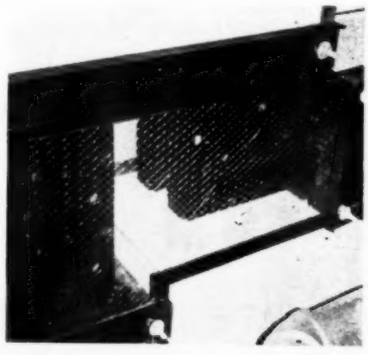
OUT OF THE WAY *of storage or working space, these three-unit banks of 10 kva. capacitors are mounted beneath the weave room floor and connected to motor circuits in this textile mill.*

switch for each bank is mounted on the back of this frame and can be hook operated from the floor.

DUCT WINDOW

Bus distribution networks in the new General Electric headquarters in Chicago employ ventilated tubes in a transite enclosure. To allow a view of the interior in showing off the system to visitors, the Fries-Walters Electric Co., contracting electrical engineers, installed a wire glass plate over a junction in the duct.

The ¼-inch glass replaces a portion of the transite enclosure and is supported by the duct angle iron framework. The entire assembly is suspended from the ceiling on heavy channel iron hangers.



DUCT WINDOW *permits view of bus bars inside transite enclosure.*



C. J. Baish, 3-Department Foreman at the G-E Conduit Factory, New Kensington, Pa.

Mr. Baish is foreman of the "pickling", galvanizing and enameling departments. He started working in the factory 28 years ago and has had long, thorough experience in making conduit. There are 125 men in his departments.

The Quality of G-E Rigid Conduit Is Aided by "Pickling"

No. 2 of a series—Men and Processes Behind G-E Conduit



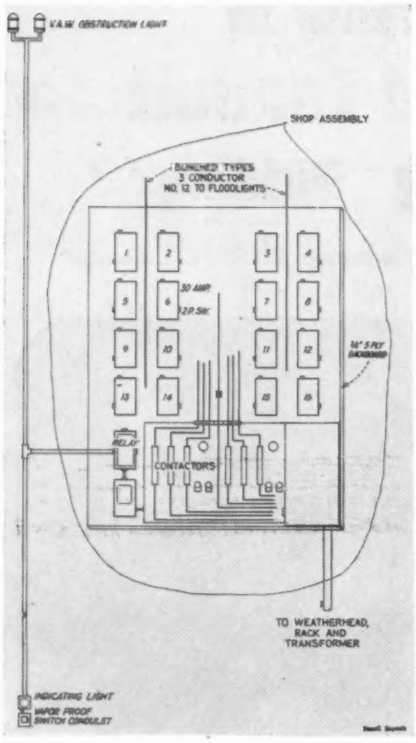
G-E Conduit in the exclusive G-E "Pickling" Machine

"PICKLING" is an important operation in the manufacture of G-E conduit, both G-E White and G-E Black. This chemical cleaning process prepares the mild steel tubing for further operations and lays the foundation for the uniform high quality of G-E Conduit. Thirty tons of tubing are chemically cleaned at one time by rotary action in the exclusive acid "pickling" machine designed by General Electric. Every piece of steel tubing is cleaned by the acid inside and out leaving the tubing free from rust and scale.

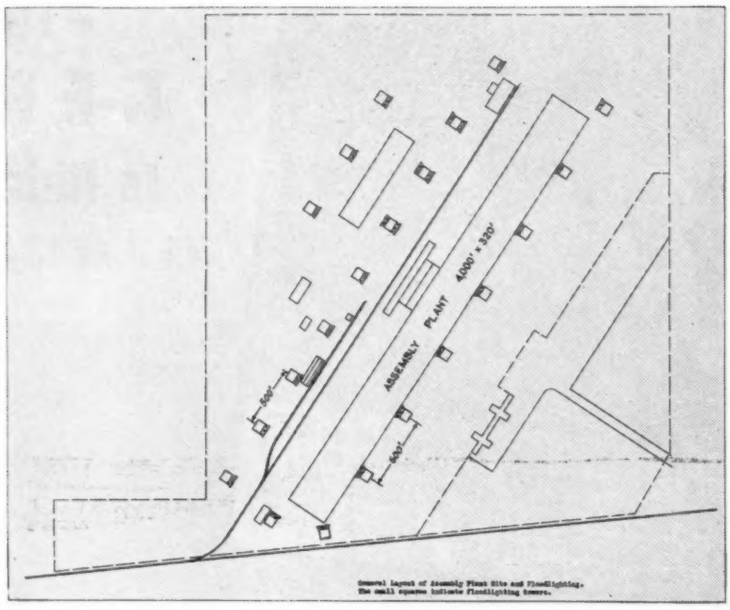
Skilled men guide this operation carefully, paying special attention to the proper loading of the machine and keeping a close check on the solution. After the "pickling" operation, the tubing is washed in cold and hot water and then dried and inspected against light. This careful chemical cleaning, prior to hot-dipped galvanizing or enameling, helps insure a lasting finish.

For further information, see the nearest G-E Merchandise Distributor or write to Section C-180, General Electric Co., Appliance and Merchandise Dept., Bridgeport, Conn.

GENERAL ELECTRIC



CONTACTOR PANEL *layout—30 amp. switches provide circuit protection; bank of floodlights are controlled by a 6 pole contactor operated from the base of the tower.*



FLOODLIGHT TOWERS *are located 600 feet back of one building line to allow material handling space. Lamps are readjusted for each major construction schedule.*

sponsible for the design of the floodlighting system and for the design and installations of the tower-supported primary line and transformers and for serving lines and substations.

All electrical work on the load side of the transformers was performed by the Allen Electric Company. Design and installation, in common with all other work at the assembly plant site, was subject to the supervisory control and approval of the U. S. Engineers office.

TABLE I: MAJOR ITEMS OF LIGHTING AND WIRING EQUIPMENT USED FOR THE FLOODLIGHTING SYSTEM

18—2000 watt totally enclosed narrow beam mirrored glass reflector floodlights
371—1500 watt polished Alzak aluminum narrow beam open type floodlights
144—1500 watt porcelain enamel floodlights with Alzak inner reflectors
21—120 ampere 3PSN, type D safety switches
21—100 ampere 3PSN, type D safety switches
21—60 ampere 3PSN, type C safety switches
336—2P2F 30 ampere safety switches
42—3 pole magnetic contactors
2100—feet #12, 3 conductor neutral wrap concentric service cable
2100—feet # 2, 3 conductor neutral wrap concentric service cable
2100—feet # 12, 3 conductor type S cable.

Compromises Necessary

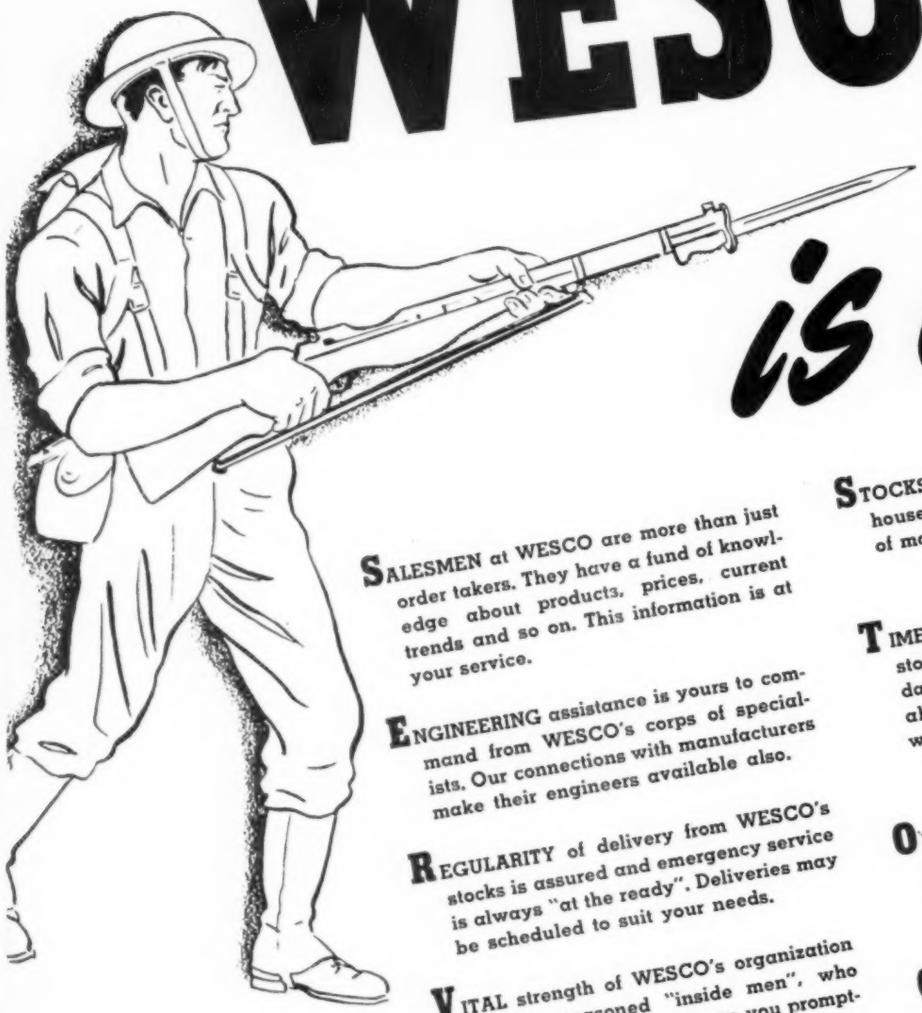
In common with later actual installation the matter of design was on a speed-up basis and was necessarily influenced by a number of conflicting and modifying circumstances. The plan had to be made to fit floodlighting equipment which could be obtained quickly. The normal procedure of selecting equipment to fit the job was reversed to a certain extent and the design made to fit the equipment. Towers had to be few and far between to provide a minimum of interference with grading operations. Lighting considerations called for the location of towers as close as possible to the actual plant. This was opposed to the necessity of locating one row of towers several hundred feet away from the desirable location in order to provide clear space for material handling.

The installation, as completed, reflects the series of compromises which influenced its planning and construction. With the exception of expected heavy shadow areas in footing pits and other excavations and lesser shadow areas caused by earth dumps and stacked materials, the illumination is sufficiently uniform and of sufficient quantity to permit night-time conduct of all construction work.

The plant proper when completed will be 4,000 feet long by 320 feet wide. This area plus the adjacent areas which will carry supplementary buildings was of prime importance from the lighting standpoint. However, a sizeable portion of surrounding area also had to be lighted for grading and for material handling. Twenty-one towers, spaced from 500 to 600 feet apart, carry a 4100 volt primary at sufficient height to clear all equipment which may come within range. Each tower houses a transformer and banks of 24 to 32 1500-watt and 2000-watt floodlights. The entire project required the installation of 533 units.


AMERICA ON GUARD
Behind American manpower, planes, ships and guns stands American industry and commerce. Wesco, with the national facilities of 79 Branches, will be "on guard" during the emergency, ready to serve you with its multiple services and quality products such as are displayed in this insert. Wesco pledges its utmost co-operation to supply you
WHAT YOU NEED
WHEN YOU NEED IT
WHERE YOU NEED IT
FROM ONE SOURCE OF SUPPLY
Westinghouse
Electric Supply Company
The name that means everything in electricity
A NATIONAL DISTRIBUTING ORGANIZATION WITH 79 BRANCHES

WESCO, too, is at the



SALESMEN at WESCO are more than just order takers. They have a fund of knowledge about products, prices, current trends and so on. This information is at your service.

ENGINEERING assistance is yours to command from WESCO's corps of specialists. Our connections with manufacturers make their engineers available also.

REGULARITY of delivery from WESCO's stocks is assured and emergency service is always "at the ready". Deliveries may be scheduled to suit your needs.

VITAL strength of WESCO's organization are the seasoned "inside men", who know their stocks and serve you promptly. In this field they rate as experts.

INFORMATION that is hard-to-get can be found at WESCO houses. Prices—priorities—shipping information—engineering data—all is available for the asking.

CREDIT is easy to arrange with WESCO, if you have a sound financial record. The fact that we have over 60,000 accounts on our books proves that!

EVERYONE wants to buy at the right price. WESCO's prices are truly competitive. Orders sent without prices are billed at the most favorable discounts.

STOCKS are ready at each of our 79 houses. You frequently have the choice of more than one source of supply.

TIME is vital these days. If our ample stocks do not include just what you want, daily contact with manufacturers enables us to clear your special orders with maximum speed.

OPERATING conditions require careful scheduling of material deliveries—schedules that we hold to closely at all times.

COURTESY and consideration are accorded every order — large or small — at WESCO. Your interests are first with us.

KNOWLEDGE of electrical products and their wholesale distribution is a primary requirement of every WESCO employee, most of whom have come up through the ranks.

STRENGTH of our buying power means that you, as well as we, get the best prices and deliveries. You'll profit by joining forces with WESCO.



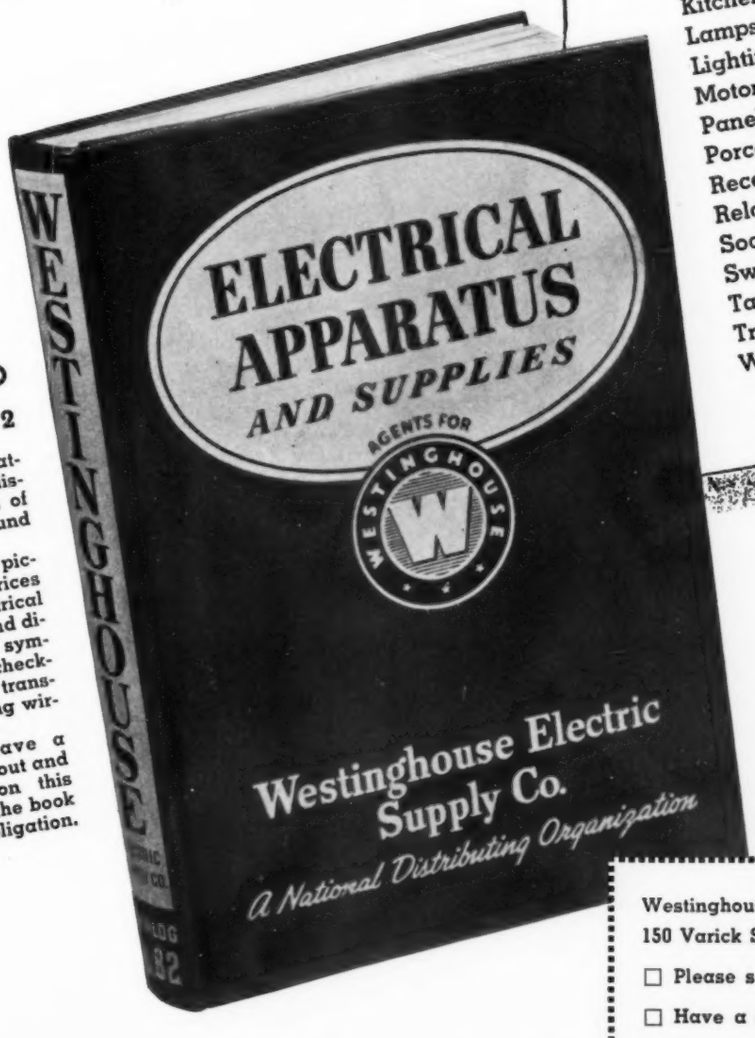
Westinghouse

Electric Supply Company

A National Distributing Organization with 79 Branches

"Ready"

WESCO National Services and Stocks speed up defense programs of the electrical industry *by saving important time*



INDEX

Annunciators
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Porcelain
Receptacles
Relays
Sockets
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Tape
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Wire

New!...WESCO CATALOG No. 82

Perhaps we're exaggerating to call this catalog indispensable. But thousands of electrical men have found it so.

It contains 704 pages; pictures; descriptions and prices of thousands of electrical products; with tables and diagrams for daily use; symbols, formulae, etc. for checking up on motors and transformers and for making wiring layouts.

If you do not have a WESCO catalog, fill out and mail the coupon on this page. We will send the book promptly, without obligation.

WESCO BRANCHES ON LAST INSERT PAGE

Westinghouse Electric Supply Company
150 Varick Street, New York City

☐ Please send me a copy of your catalog No. 82.

☐ Have a representative call.

Name .....

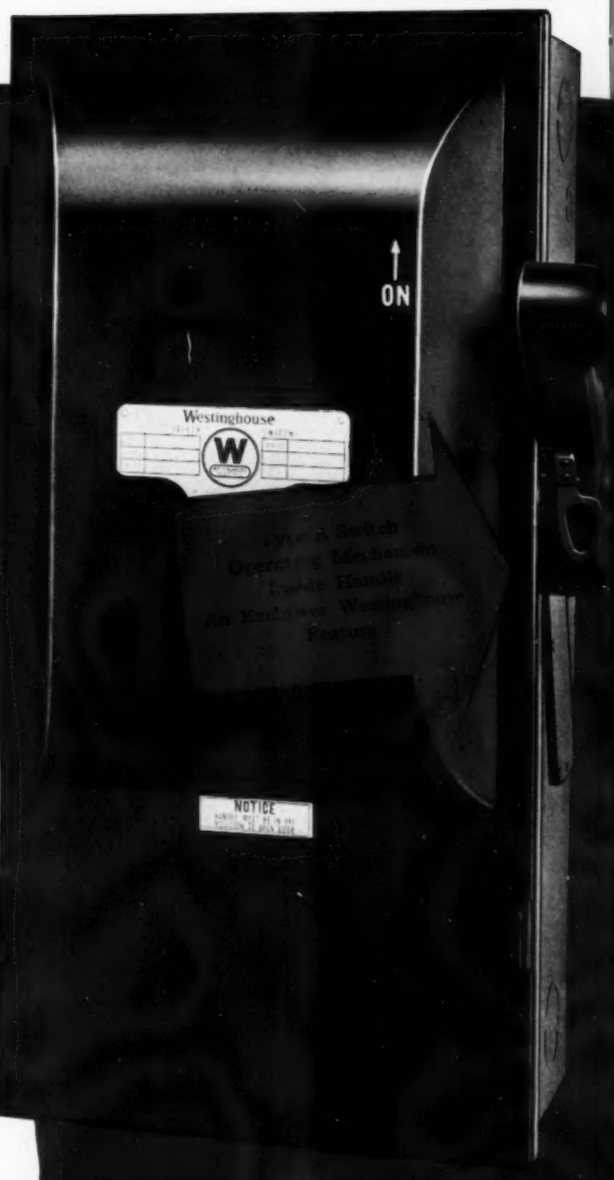
Company .....

Address .....

City ..... *State* .....

For Defense—WESCO'S National Services and Stocks

protect PRODUCTION CIRCUITS WITH WESTINGHOUSE SAFETY SWITCHES



SAVE MAINTENANCE
EXCLUSIVE DIAMOND-POINTED BREAK JAW KEEPS ARCING OUTSIDE CONTACT AREA



The ordinary way. Arc travels across switch jaw.



The Westinghouse way. Arc outside contact area.

SAVE POWER
ONE-PIECE COPPER CONSTRUCTION REDUCES HEAT LOSS



One-piece copper construction saves money from power loss. Westinghouse safety switches have from 2 to 7 less contact points per pole.

THESE FEATURES MEAN EASIER INSTALLATION —LOWER MAINTENANCE

Concentric knock-outs, top, bottom and both sides • Solderless lugs • Reinforced fuse clips assure maximum fuse contact and reduce heating.

Warpproof, moistureproof Micarta crossbar • Steel parts cadmium-plated to resist rust and corrosion • Wearing parts of operating mechanism heat-treated for longer life • Door can be padlocked to prevent unauthorized operation • Switch operating mechanism inside handle on Type A leaves ample wiring space, prevents damage to conductor insulation • Non-carbonizing composition base • Quick-make, quick-break on Types A and C minimizes switch burning.

WESTINGHOUSE ELECTRIC & MFG. CO.
EAST PITTSBURGH, PA.

J-21147

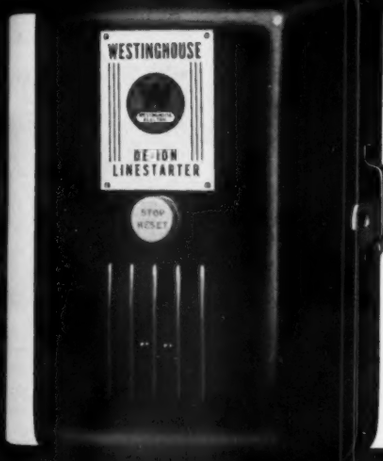
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FOR PRODUCTION INSURANCE

buy Westinghouse

TIME SAVERS FOR INDUSTRY



WESTINGHOUSE "DE-ION" LINESTARTER

Magnetic Across-the-line Starter
CLASS 11-200

Push-button operated—built-in or mounted separately. Small, compact construction saves space. Bi-metal overload protection — hand or automatic reset. "De-ion" protection for contacts reduces maintenance. Vertical magnet operation speeds contact opening and prevents accidental operation.



WESTINGHOUSE AB-I BREAKER

For Circuit Protection

Eliminates switch and fuses. Bi-metal overload protection. "De-ion" protection for contacts. Saves maintenance time and production time—circuit outages can be restored by operator. No live parts exposed. Door opens only when switch is in "Off" position. Occupies approximately 40% less space than switch and fuses.



WESTINGHOUSE COMBINATION LINESTARTER

For Motor Control and Circuit Protection
CLASS 11-206

Magnetic motor starter—motor circuit switch—motor overload protection—nofuze circuit protection—all in one unit. Bi-metal gives permanently accurate overload protection. "De-ion" quenchers protect contacts—save maintenance. Four-in-one Unit saves installation time—saves space—saves wiring—provides greater protection for operators.

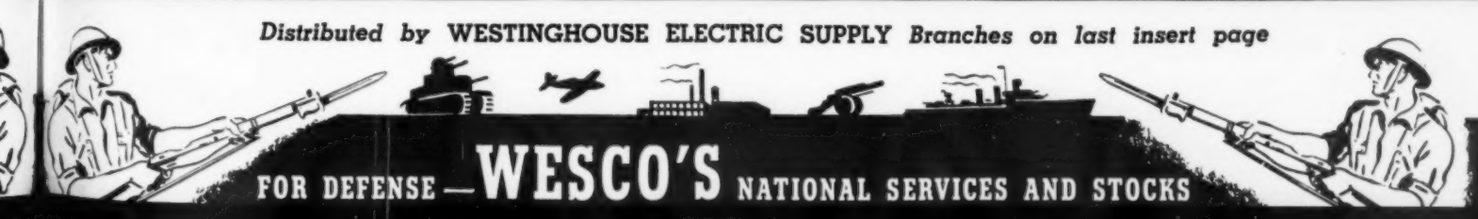


WESTINGHOUSE "DE-ION" MOTOR WATCHMAN

Manual Across-the-line Starter for Motors up to 7½ hp.
CLASS 10-100

Quick-make, quick-break toggle action prevents "teasing" contacts. "On," "Off," "Tripped" positions self-indicating. Bi-metal disc overload protection. "De-ion" protection for contacts. Ample wiring space. Rust-resisting parts. Silver contacts. Keyhole mounting for quick, easy installation.

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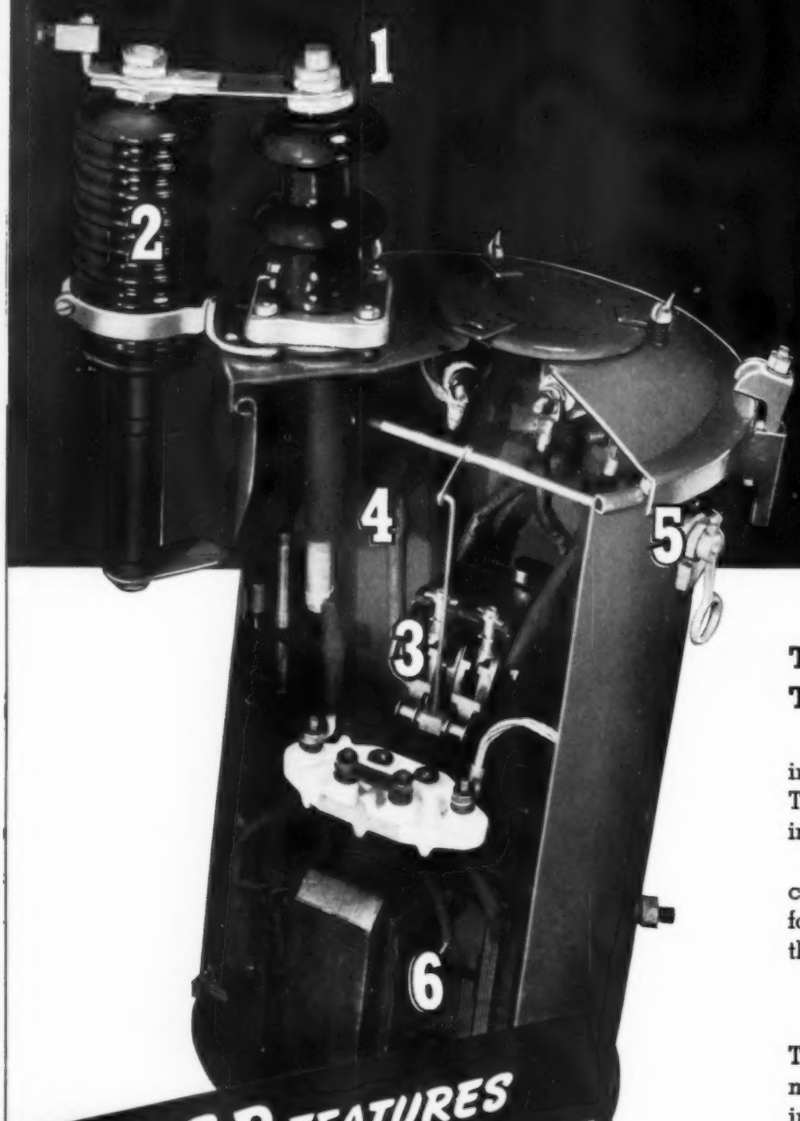


FOR DEFENSE — WESCO'S NATIONAL SERVICES AND STOCKS

EVEN WHEN YOU SAVE ON TREE TRIMMING

C-S-P

WON'T BURN OUT!



C-S-P FEATURES

1. High Voltage Bushing
2. De-ion Gap Lightning Protection
3. Type FR Secondary Breaker
4. Protective Link
5. Breaker Operating Handle
6. Transformer Coils—Surge Tested.

THE C-S-P PRINCIPLE PROTECTS THE TRANSFORMER AGAINST SHORTS

Economies based on less tree trimming always result in increased transformer burnouts. When you use C-S-P Transformers under these circumstances a service interruption may result—but not a burnout.

They are self-protecting against burnouts. When conditions exist that would be hazardous to other transformers, C-S-P's automatic breaker merely takes it off the line until the danger has been removed.

MAKES CASH SAVINGS

This is only one C-S-P economy feature, but it can be a mighty important one. C-S-P makes savings in first cost, in installation cost, in maintenance and in freedom from service interruptions. And these savings are proved by the operating records of a thousand power companies.

ONLY C-S-P BRINGS YOU

1. Complete self-protection against service interruptions from fuse outages.
2. Complete self-protection against lightning.
3. Complete self-protection against burnouts from short circuits.
4. Complete self-protection against burnouts from overload.
5. PLUS, simplified installation, low cost construction, and lower maintenance cost, for every year of service.

Ask any Westinghouse man for complete details.

J-70238

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FOR DEFENSE—**WESCO'S** NATIONAL SERVICES AND STOCKS

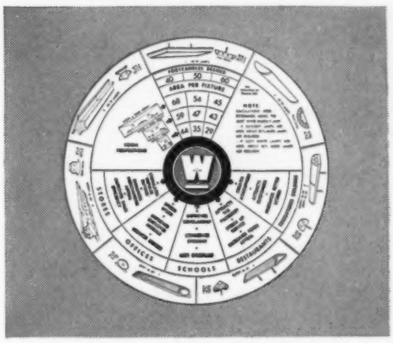


WESTINGHOUSE MAZDA F LAMPS

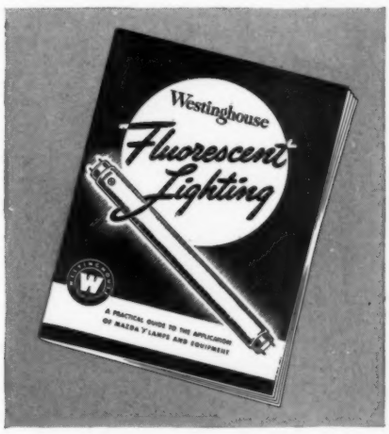
A complete line of Colors and Sizes

DAYLIGHT, 3500° WHITE			
14 watt	15" long	1½" diameter	$0.90
15 watt	18" long	1" diameter	.75
15 watt	18" long	1½" diameter	.95
20 watt	24" long	1½" diameter	.95
30 watt	36" long	1" diameter	.95
40 watt	48" long	1½" diameter	1.35
100 watt	60" long	2⅛" diameter	3.00
SOFT WHITE			
14 watt	15" long	1½" diameter	$1.00
15 watt	18" long	1" diameter	.85
15 watt	18" long	1½" diameter	1.05
20 watt	24" long	1½" diameter	1.05
30 watt	36" long	1" diameter	1.05
40 watt	48" long	1½" diameter	1.50
100 watt	60" long	2⅛" diameter	3.20
BLUE, GREEN OR PINK			
14 watt	15" long	1½" diameter	$1.05
15 watt	18" long	1" diameter	.90
15 watt	18" long	1½" diameter	1.10
20 watt	24" long	1½" diameter	1.10
30 watt	36" long	1" diameter	1.10
40 watt	48" long	1½" diameter	1.60
RED OR GOLD			
14 watt	15" long	1½" diameter	$1.15
15 watt	18" long	1" diameter	1.00
15 watt	18" long	1½" diameter	1.20
20 watt	24" long	1½" diameter	1.20
30 watt	36" long	1" diameter	1.20
40 watt	48" long	1½" diameter	1.70

Get this handy aid for calculating the right kind of equipment for every lighting job.



The new Fluorescent Fixture Selector shows at a glance what fixtures will give high level lighting for any area.



This 24-page "Guide to the Application of Fluorescent Lighting" is one of many Westinghouse helps now available.

NEW WESTINGHOUSE PLANT HAS CAPACITY OF MILLION MAZDA F LAMPS A MONTH!



A million Westinghouse Mazda F Lamps a month! That is the capacity of this new Westinghouse Plant at Fairmont, West Virginia.

FOR FLUORESCENT LIGHTING AT ITS BEST, SELL AND SPECIFY ⬇



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FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS

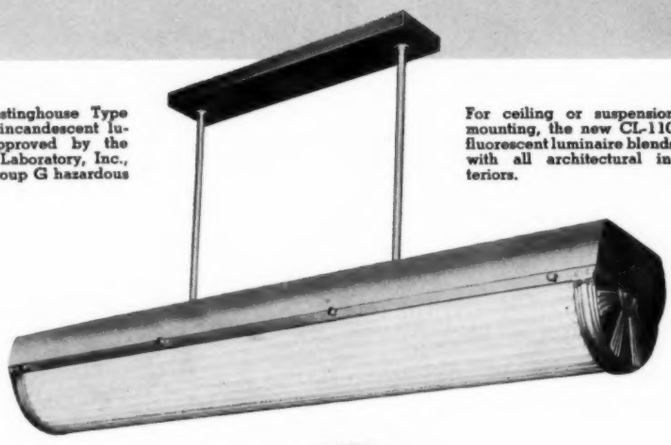
A FULL LIGHTING LINE

FROM WESTINGHOUSE

for quicker seeing and safety...
in American Defense Production

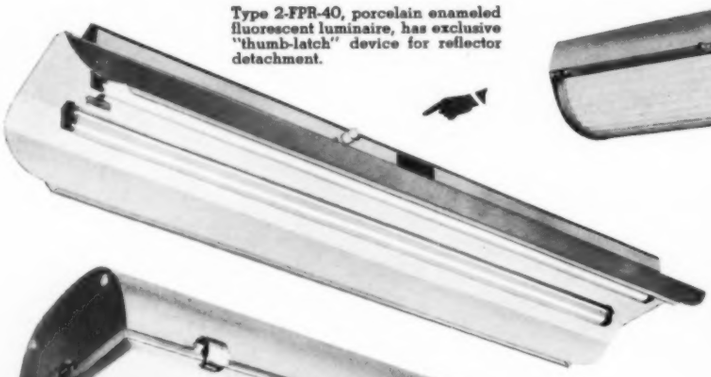


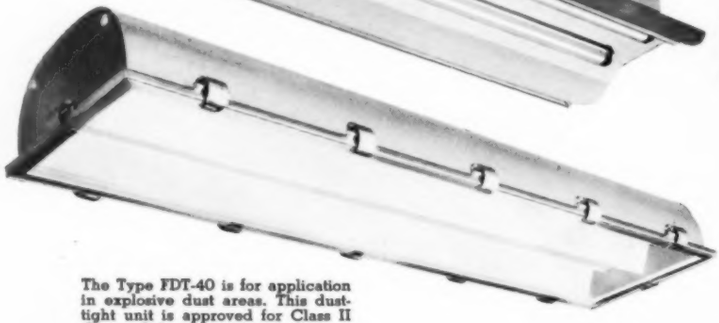
This new Westinghouse Type DT dust-tight incandescent luminaire is approved by the Underwriters' Laboratory, Inc., for Class II Group G hazardous locations.



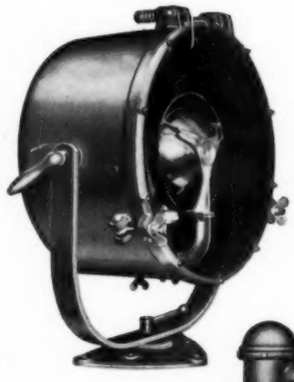
For ceiling or suspension mounting, the new CL-110 fluorescent luminaire blends with all architectural interiors.

Type 2-FPR-40, porcelain enameled fluorescent luminaire, has exclusive "thumb-latch" device for reflector detachment.





The Type FDT-40 is for application in explosive dust areas. This dust-tight unit is approved for Class II Group G hazardous locations.



For protective lighting, the Westinghouse 16-inch Searchlight projects a concentrated beam for great distances. This Searchlight has wide use in protective lighting.



Type MF-180 floodlight produces a "pancake of glare light" for plant protection.



New FPS "High Vision" luminaire is designed for continuous runs of high-intensity fluorescent lighting in industrial areas.

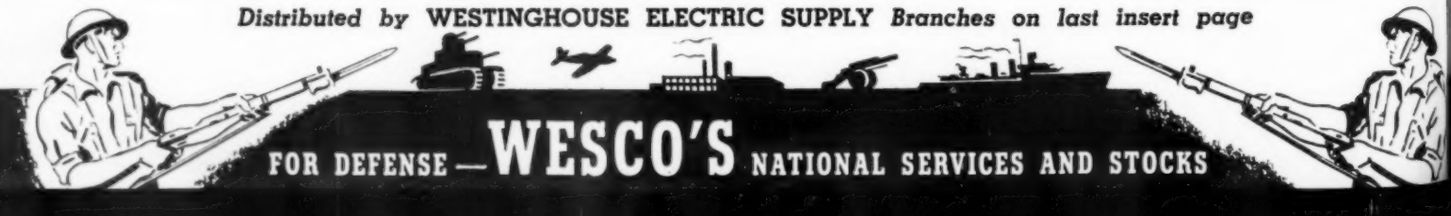


The Westinghouse Type AF, open porcelain enameled floodlight is designed for industrial yards, outdoor construction projects and sport areas.

Westinghouse Engineered Seeing

—LIGHTING BUILT FOR QUICKER VISION—

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FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS

ASK FOR

WESTINGHOUSE ENGINEERED SEEING

Industry today insists on efficiency-wise, high intensity lighting. Westinghouse answers with *engineered seeing.*

Engineered seeing provides high-speed vision for business and industry, through lighting systems designed for the specific job. Westinghouse combines its years of experience in application engineering to give you this practical technique of light for seeing—and safety.

The latest contribution of *engineered seeing* is the new Type FPS-40 "High Vision" luminaire for continuous runs of fluorescent light. It offers industry a long-needed extended light source; higher intensities; a flexible lighting system for changing production needs; a cooler light with low brightness and greater efficiency; quick, easy installation and maintenance.

Engineered seeing is available through your Westinghouse Lighting Distributor. His Lighting Specialists will gladly work with you on your specific lighting problems. Or, you may write to Westinghouse Elec. & Mfg. Co., Edgewater Park, Cleveland, O.



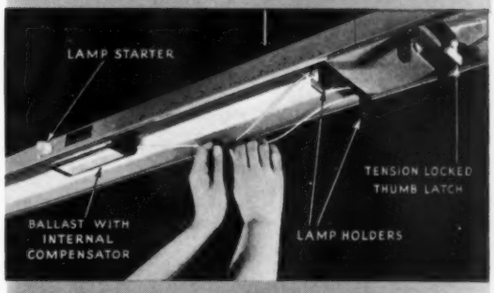
HERE'S THE WHOLE STORY ON "High Vision" LIGHTING

Find out how the FPS "High Vision" luminaire will provide *engineered seeing* in America's industrial plants.

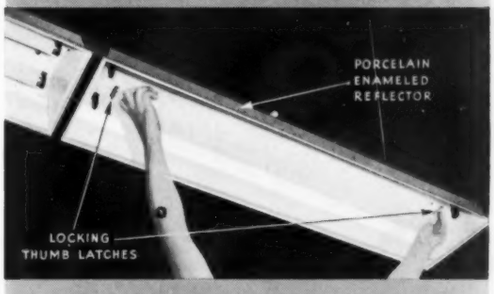
Get full details, including complete installation data and mechanical features. Ask your Westinghouse Lighting Distributor for fluorescent folder 8654, six graphic pages of usable lighting information.



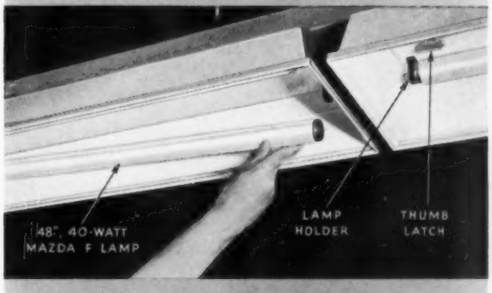
Type FPS "High Vision" luminaires may be installed with provision for additional units and continuous lines of light. Channel sections are mounted on conduit, messenger cable, twin-rods or on the ceiling.



All auxiliary equipment is mounted in and wired as part of the channel assembly. Ballast equipment is standard Westinghouse high power-factor type. Line connectors may be quickly spliced to the fixture leads.



The white porcelain enameled reflector has a shielding angle of 13 degrees. Without the use of tools, the reflector is fastened to the channel and held in position by two tension-locked thumb-latches.



Depending on the style of reflector selected, either two or three 48-inch, 40-watt fluorescent lamps may be used. Lamp starters are located on the side of the channel and may be replaced as readily as the lamp itself.

Westinghouse LIGHTING EQUIPMENT

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Reporting for Active Service



NOW more than ever, you want the selective service that only a highly diversified line of top-quality wiring devices has to offer. Whether it's a defense project or "business-as-usual" construction, Bryant Wiring Devices assure you of superiority in quality as well as workmanship. All Bryant devices are seasoned veterans you can depend on for all-out performance and long service.

The country-wide network of Westinghouse Electric Supply Company facilities is at your command, ready to help you keep America's emergency program on the march. If you haven't a copy of the latest Bryant Catalog (No. 40), write for one. The Bryant Electric Company, Bridgeport, Connecticut.

BRYANT

SUPERIOR WIRING DEVICES

Every outlet deserves a Bryant device

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On Guard!



"In this breathless drive for quantity production, let there be no compromise with quality. Quality is still legal tender in this country, no matter how often counterfeited."

GUARDING the safe conduct of electricity from generator to every kind of useful work

T & B Pressure (Solderless) Connectors

are on the job for National Defense—on land and sea, under the sea and in the air.



THE THOMAS AND BETTS CO., INC.

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

Factory, Engineering and Executive Offices, Elizabeth, N. J.

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FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS

98% Reduction in Shutdowns

due to fuses has resulted since we installed BUSS Super-Lag FUSES

. . . says Chief Electrician Howard I. Evans, Lion Oil Refining Co., Eldorado, Ark.



"We keep a record of all shutdowns"

. . . "and," Continues Mr. Evans, "WE NOW OPERATE WITHOUT A NIGHT MAINTENANCE MAN"

"We have approximately a 2000 h.p. load consisting of about 130 motors ranging in size from 1 to 250 h.p. Most of these motors are protected by fuses.

"In order to locate sources of trouble we keep a record of all shutdowns. Several years ago we were surprised to find shutdowns were often due to poorly designed fuses blowing needlessly.

"To try to correct this condition we installed BUSS Renewable Fuses. The results were better than we had hoped for—shutdowns due to fuses dropped to about 1% of their former number—a reduction of over 98%.



"I'll hand it to Buss Fuses, they helped us"

"We have so little fuse trouble that we now operate without a night maintenance man—and in the past year I've been routed out of bed only about three times.



"We now operate without a night maintenance man"

Anyone interested in plant operation or maintenance can profit by following Mr. Evans' lead

There are sound reasons why BUSS Super-Lag fuses don't blow needlessly. The design of the BUSS Fuse-Case is such that it reduces to a minimum any chance for poor contact to develop within the fuse itself.

When a BUSS Fuse is assembled good contact is automatically made on the link and this good contact will remain no matter how long the fuse is in use. Hence one of the great causes of needless blows is practically wiped out.

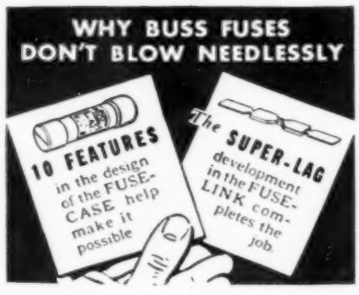
To guard against starting currents or other harmless overloads blowing the fuse—"lag-plates" are attached to the Super-Lag link. They give the fuse a long time-lag or retarded blowing point.

Thus, when two or more motors start at the same time or a motor starts under a heavy load or a machine jams momentarily or other such things occur that cause harmless overloads—BUSS fuses hold instead of blowing and the circuit is kept in operation.

How to Get Quick Results in Your Plant

If you believe that a protective device should guard against senseless interruptions of electrical service as well as against electrical hazards—just pass the word along that all stock and purchase records should be changed immediately to call for BUSS Super-Lag fuses.

Or if you would like more information about BUSS Super-Lag fuses to pass along to other men in your plant, ask for bulletin Rcs.



BUSSMANN MFG. CO.,
ST. LOUIS, MO.
Division McGraw Electric Co.

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"RIGHT OFF THE SHELF" ★ ★ ★

IF YOU ACT FAST! Wesco branch stocks make it possible, in most cases, for you to buy top flight ILG equipment *right off the shelf* . . . even though ILG is devoting a large part of its production to National Defense orders! This "he-man" apparatus, choice of shrewd management for over 35 years, takes 3-shift, 24-hour-a-day continuous performance right in its stride . . . stands ready to serve long years after the present emergency is over. For help on your specific heating or ventilating problem, phone nearest branch office or write today.

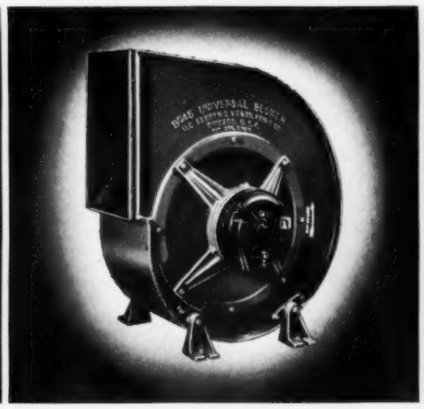
ILG ELECTRIC VENTILATING COMPANY ★ 2879 N. CRAWFORD AVE. ★ CHICAGO, ILL.

OFFICES IN 43 PRINCIPAL CITIES

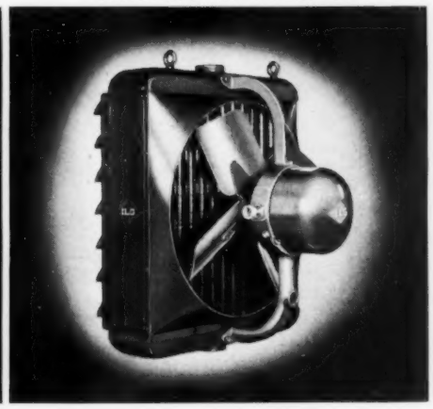
Self-Cooled Motor **PROPELLER FANS**



Direct-Connected **UNIVERSAL BLOWERS**



"Vital Zone" **UNIT HEATERS**



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FOR DEFENSE—**WESCO'S** NATIONAL SERVICES AND STOCKS

Always Easy to





This patented knurled inside finish makes wire-pulling easier—as much as 30%.



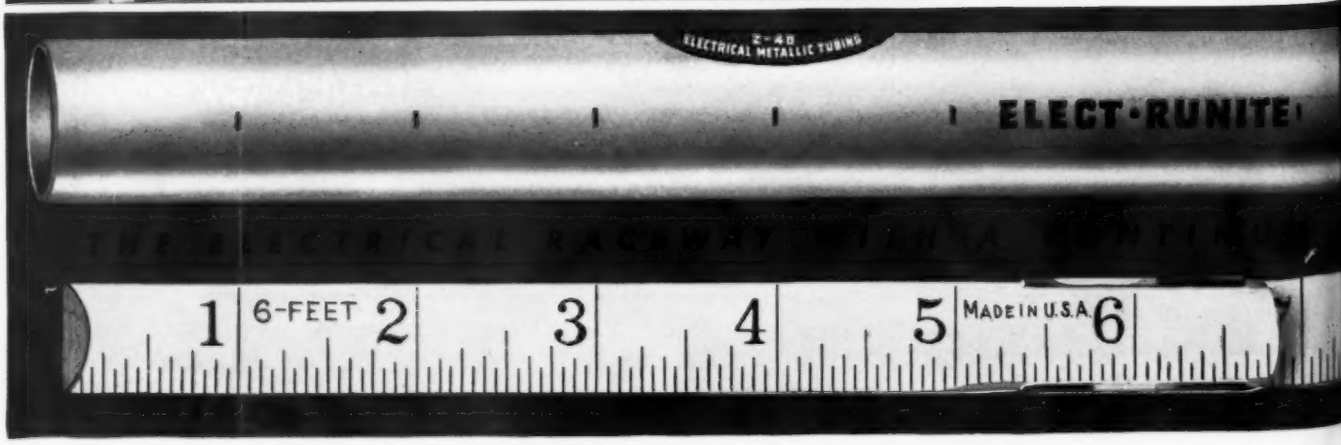
Three simple compression-type fittings end tedious, dirty thread-cutting and "steamfitting" operations.



Complete bending instructions and diagrams are provided on this tag with every shipment of tubing.



The ELECTRUNITE Bender makes bending by hand easier and more accurate than ever before.



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FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS

Handle and Install

-NOW EASIER THAN EVER BEFORE

"INCH-MARKED"

PAT. APPLIED FOR

ELECTRUNITE Steeltubes

REG. U. S. PAT. OFF.

UNDERWRITERS' LABORATORIES, INC. INSPECTED RIGID ELECTRUNITE REG. U.S. PAT. OFF. STEELTUBES 2-48 ELECTRICAL METALLIC TUBING

When ELECTRUNITE STEELTUBES — the original electrical metallic tubing—was developed, Steel and Tubes engineers had two objectives in mind — to provide the protection of steel for wiring at low cost and to make work easier for the electrician.

As first introduced, ELECTRUNITE STEELTUBES did both — but the engineers were not satisfied. They set out to better the product — and of the many improvements resulting, none has been of greater value than the most recent—"inch-marking" and the new ELECTRUNITE Bender.

Today, "Inch-Marked" ELECTRUNITE STEELTUBES is the only steel raceway which is clearly and accurately marked off in inches and feet.

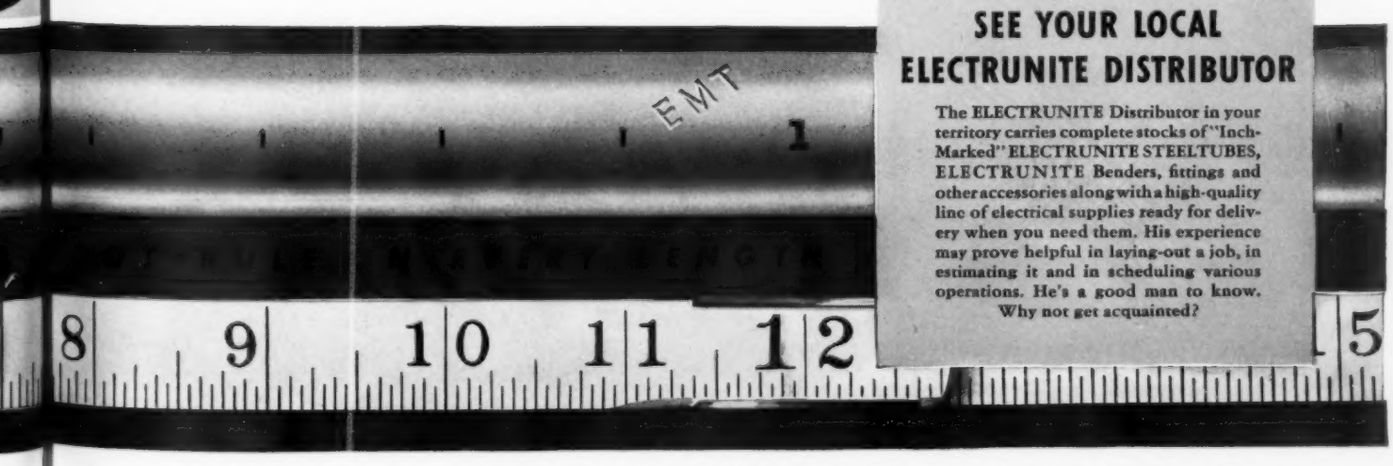
Think what this improvement alone can mean to you on the job. You don't need a foot-rule for measuring or marking. There's a continuous foot-rule right on the tube. Your mark for cutting or bending already is made for you.

Then there's the new ELECTRUNITE Bender —a one-piece casting with built-in instructions. It predetermines and makes bends by hand easier and more accurately than ever before possible. And by following the directions and diagrams on the tags furnished with each shipment of tubing, any good mechanic can make any standard type bend the first time he uses "Inch-Marked" ELECTRUNITE STEELTUBES.

Yes, "Inch-Marked" ELECTRUNITE STEELTUBES is easier to use than ever before — and it's more economical, too, because "inch-marking" eliminates need for guesswork — reduces chance for error and wasted material.

Try "Inch-Marked" ELECTRUNITE STEELTUBES on your next job—exposed, concealed or in concrete. See for yourself how easy it is to handle — and you'll want to use it on every job. Steel and Tubes Division, Republic Steel Corporation, Cleveland, Ohio.

REPUBLIC STEEL DEFENSE FOR AMERICA



SEE YOUR LOCAL ELECTRUNITE DISTRIBUTOR

The ELECTRUNITE Distributor in your territory carries complete stocks of "Inch-Marked" ELECTRUNITE STEELTUBES, ELECTRUNITE Benders, fittings and other accessories along with a high-quality line of electrical supplies ready for delivery when you need them. His experience may prove helpful in laying-out a job, in estimating it and in scheduling various operations. He's a good man to know. Why not get acquainted?

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FOR DEFENSE — WESCO'S NATIONAL SERVICES AND STOCKS

FIRST THINGS FIRST

with each and all of us



IN business and our private lives alike, the Nation's need comes first, to-day. You, as contractors, know how, on defense work—plant enlargements, shop remodeling, essential housing—the way is open for securing the materials essential to the job. The precedence in which your orders are filled is, however, regulated by priorities—and, in turn, our purchases of practically all raw materials are furnished on preference classifications. In times like these each of us must keep "first things first" as our part in the gigantic industrial contribution this country must make to preserve all Democracy stands for.



GENERAL CABLE

BARE and INSULATED WIRES and CABLES for EVERY ELECTRICAL PURPOSE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT • HOUSTON
KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

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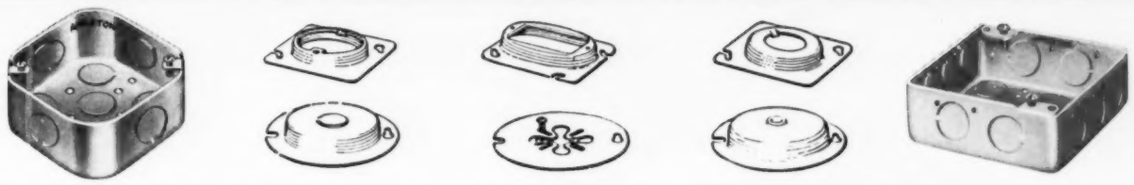
PLAN FOR SAVING TIME

Select Outlet and Switch Boxes and All Conduit Fittings from the

COMPLETE LINE

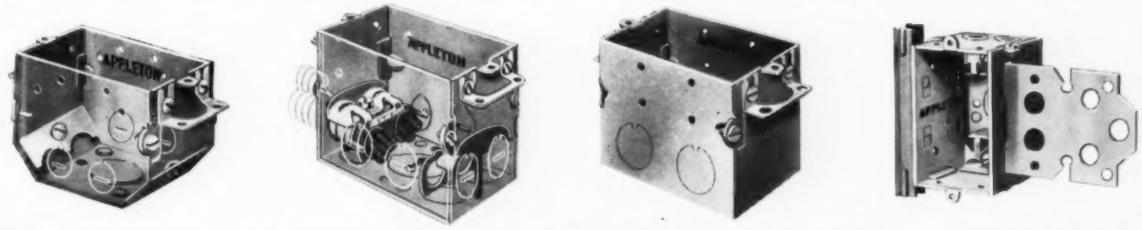
That Meets Every Preference and Specification

For Example



3¼ AND 4 INCH OCTAGONAL BOXES—4 AND 4 11/16 INCH SQUARE BOXES—WIDE SELECTION OF COVERS

For Example



SWITCH BOXES, VARIOUS DEPTHS, WITH OR WITHOUT CLAMPS AND BRACKETS

For Example

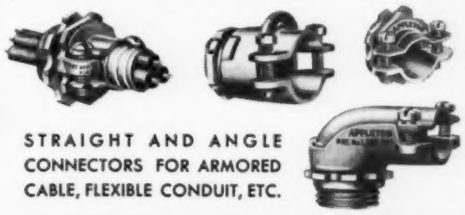


COUPLINGS AND CONNECTORS, ENTRANCE FITTINGS, CLAMPS, ETC. FOR ELECTRICAL METALLIC TUBING

For Example



COUPLINGS, CONNECTORS, CLAMPS AND ENTRANCE FITTINGS FOR RIGID CONDUIT.



STRAIGHT AND ANGLE CONNECTORS FOR ARMORED CABLE, FLEXIBLE CONDUIT, ETC.

APPLETON ELECTRIC PRODUCTS REG. U.S. PAT. OFF.

The name "Appleton;" the registered trade-mark, "Unilets;" or the famous circle-A Appleton trade-mark shown above, appears on every Appleton fitting. *We manufacture no private brand goods!*

APPLETON

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FOR DEFENSE—**WESCO'S** NATIONAL SERVICES AND STOCKS

VARNISHED CAMBRIC CABLE · RUBBER POWER CABLES · BUILDING WIRE

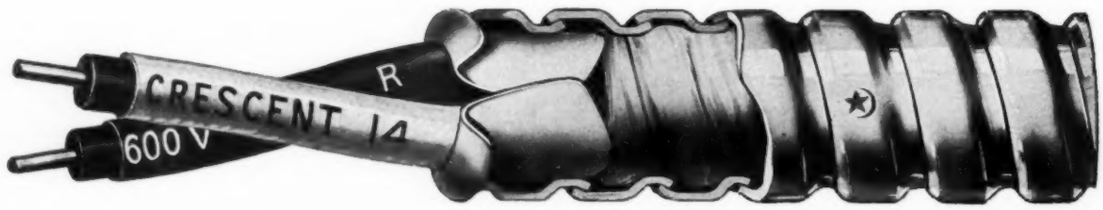
CRESFLEX NON-METALLIC SHEATHED CABLE · SERVICE ENTRANCE CABLE · MAGNET WIRE · BARE WIRE

ARMORED CABLE · FLEXIBLE CORDS · LEAD-ENCASED AND PARKWAY CABLES · SIGNAL CABLE

CRESCENT

GENUINE A.B.C.

ARMORED BUSHED CABLE



● CONDUCTORS—Clean stripping insulation and flame retarding covering, printed as shown.

BUSHING—Easy to insert as paper unwraps from *under both ends* of armor to make room for the bushing.

STEEL ARMOR — Low resistance, electro-galvanized for maximum uniformity and longest life.

TESTED—Thoroughly tested at several points during manufacture, and receiving a final test of 2000 volts between conductors and armor.

CRESCENT—Unexcelled facilities for the complete manufacture of Armored Bushed Cable in all its steps. When you buy CRESCENT A.B.C. ARMORED BUSHED CABLE you buy the best.

CRESCENT INSULATED WIRE & CABLE CO.

CRESCENT
WIRE and CABLE
Factory: TRENTON, N. J.—*Stocks in Principal Cities*

CRESCENT ENDURITE SUPER-AGING INSULATION · WEATHER-PROOF WIRE

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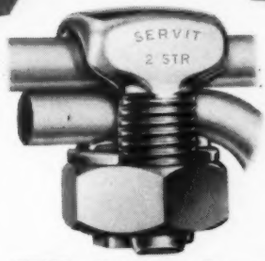
FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS

Speed up Your Hook-ups . . .

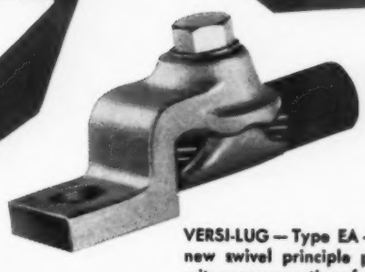
6 *Typical* BURNDY DEFENSE ITEMS AGAINST LOST TIME!



QIKLUG — Type QA — for rapid termination of wires and cables in a range of sizes. Makes compact, high strength, easily taped connections.



SERVIT — Type KS — all-purpose service connector, designed to resist vibration and corrosion. High pressure contacts.



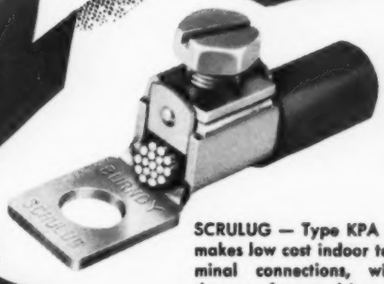
VERSI-LUG — Type EA — a new swivel principle permits easy connection of conductor at various angles.



VERSI-TAP — Type QPX — for use as a tee, link, cross or parallel clamp.



VERSI-LINK—Type ER—for use as a link, reducer or elbow, with various combinations of cable sizes. Swivel cable grips join cables at several angles.



SCRULUG — Type KPA — makes low cost indoor terminal connections, with the use of screw driver or pliers.



MAIL THE *Now* COUPON
for a copy of Burndy's handy industrial wiring catalog . . .

BURNDY ENGINEERING CO., INC.
489 East 133rd Street, New York City.

WESTINGHOUSE ELECTRIC SUPPLY CO.
150 Varick St.
New York City

Please send a copy of the Burndy Catalog 41.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

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FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS



YOUR COMPLETION DATE IS COMFORTABLY MET with Day-Brite TROFFERS

Speed is not measured in units of time alone — quality and accuracy are equally essential. Spoilage, rejects and work not up to specifications — in offices or plants — have no place in the American plan... Therefore, correct illumination is all important — because "the better you see, the better you do."

The effectiveness of Day-Brite Troffers in meeting the need for speed can be convincingly proved — they are the perfected result of specialized experience that dates back to the inception of fluorescent itself ... And, too, you can be certain of prompt shipments because Day-Brite has the facilities and the capacity for high-speed, accurate, standardized production ... All of this means that you can comfortably meet completion dates when you specify Day-Brite!



Double-width, Day-Brite Troffers installed at Monarch Machine Tool Company.

Illustrating Day-Brite Double-width Recessed Troffers.

QUICK INSTALLATION AND EASY SERVICING FEATURES



Day-Brite Troffers can be quickly installed. In metal-pan acoustical ceilings, they "snap" into place. In other type ceilings — acoustical blocks, board, plaster — they are provided with flanges for quick attachment to wood or metal grounds ... Available in single units, continuous lengths, single and double-row lamps — that can be arranged for any level of intensity up to 100-foot candles ... Reflectors are of rigid, one-piece construction with no loose parts, brackets, exposed wires or other accessories to hold on to while they are quickly snapped into place ... Wireways, too, are one-piece, self-contained — which permits easy inspection because the entire wireway assembly can be dropped merely by removing two screws.

DayBrite Rivals Daylight

THE Complete Line of Fluorescent Lighting Fixtures

Day-Brite Lighting, Inc.

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FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS

RELIABLE FUSE PROTECTION IS ESSENTIAL FOR MAINTAINING PRODUCTION

In America more electrical horsepower is behind our man-power than in any country in the world.

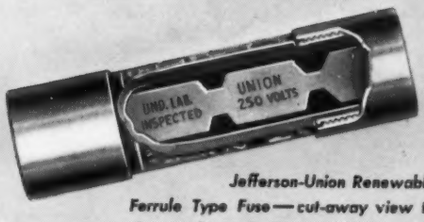
Keeping that horsepower on the job is vital—motors and machines must be kept going. Proper fusing eliminates unnecessary shut-downs and damage to motors, wiring and equipment.

Jefferson Renewable Fuses provide the safe, reliable protection needed... they prevent needless interruptions and guard against damage to equipment.

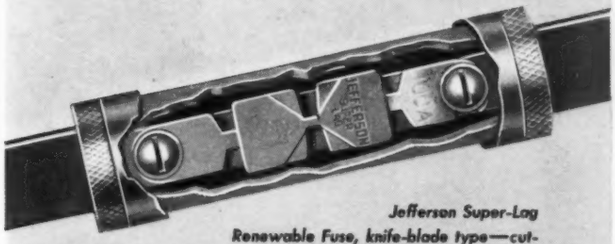
When excessive overloads require these fuses to open the circuit, they do it safely and reliably. Their rugged construction and simple design permits quick and proper cleaning, and renewing with ease.

JEFFERSON ELECTRIC COMPANY
BELLWOOD (Suburb of Chicago) **ILLINOIS**
***Canadian Factory:* 60-64 Osler Avenue, W. Toronto, Ontario**

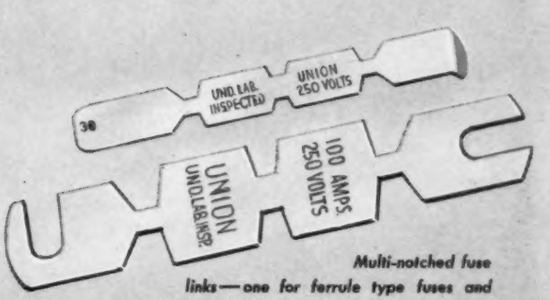
JEFFERSON ELECTRIC
Renewable
UNION FUSES SUPER-LAG



***Jefferson-Union Renewable Ferrule Type Fuse*—cut-away view to show multi-notched renewable fuse link.**



***Jefferson Super-Lag Renewable Fuse, knife-blade type*—cut-away shell shows link with lag plates.**

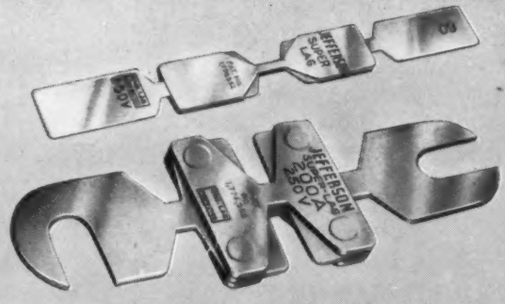


***Multi-notched fuse links*—one for ferrule type fuses and lower one for knife-blade type fuses.**

Jefferson Union Renewal Links are of the multi-notched type, providing reliable protection under normal and severe operating conditions.

The notches in the center of the link localize the heat generated during operation, producing lower temperatures at the fuse terminals.

When subjected to heavy overloads or short circuits, the multiple restricted portions of the link are fused and serve to break the arc in several places, thus a minimum amount of metal is volatilized and minimum internal pressure is generated within the fuse. The design of this link insures maximum performance and long-life for the fuse.



Super-Lag Links, for ferrule and knife-blade type fuses.

Jefferson Super-Lag Renewal Links are also of the multi-notched type, and are equipped with lag plates. The lag plates serve to dissipate heat from the restricted portions, thereby delaying the fusing of the metal during harmless temporary overloads. Under heavy overloads or short circuits, the links are fused at the restricted portions and serve to break the arc in several places, thus a minimum amount of metal is volatilized and minimum internal pressure is generated within the fuse.

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FOR DEFENSE—WESCO'S NATIONAL SERVICES AND STOCKS





Mr. Tops, Paragon's symbol of top quality

Paragon Offers A UNIT FOR EVERY TIME SWITCH NEED . . .

WHEN you have a rare or different time switch problem . . . as well as ordinary ones . . . come to Paragon. This organization of engineers has been specializing on the design and manufacture of Precision Time Switches and other time controls since 1904. Paragon units are adapted to an unlimited number of industries and appliances . . . either for defense or peace time needs. Every Paragon unit is precision built, simple, accurate, rugged, reliable and modern.

300 SERIES Self-Lubricating Time Switches. For controlling signs, commercial lights, attic fans, stokers, oil burners, blowers, pumps, valves. Only two exposed gears, dustproof, 2000% extra dial power. For 24-hour automatic switching.

"G" SERIES Heavy duty, Synchronous. Designed for extra long, hard service. 40 to 150 Amperes—single, double or three pole—one, two or three circuits. Indoor or outdoor models, with or without Sunday and holiday cutouts.

700 SERIES Equipped with 7-day self starting synchronous clock movement and 7-day program dial with each day independently adjustable.

Numerous other types available. Send for complete catalog.

• • •

PARAGON ELECTRIC COMPANY
401 So. Dearborn Street • Chicago, Illinois

Paragon Chicago
BUILDERS OF CONTROL INSTRUMENTS . . . SINCE 1905

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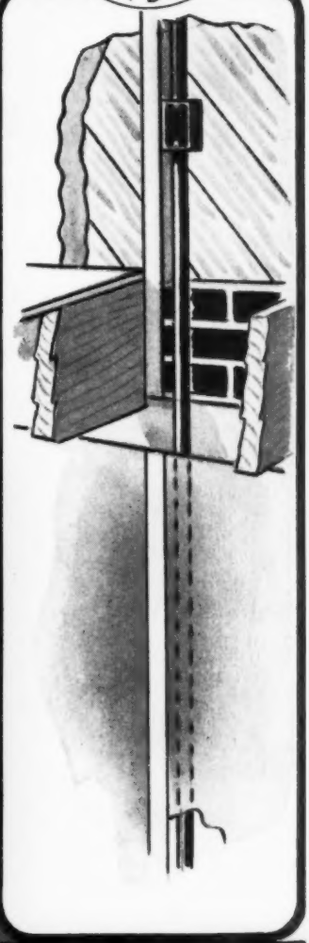
-for Home Defense ★

Buckeye steel conduit simplifies installation of extra telephones that guard welfare of the home

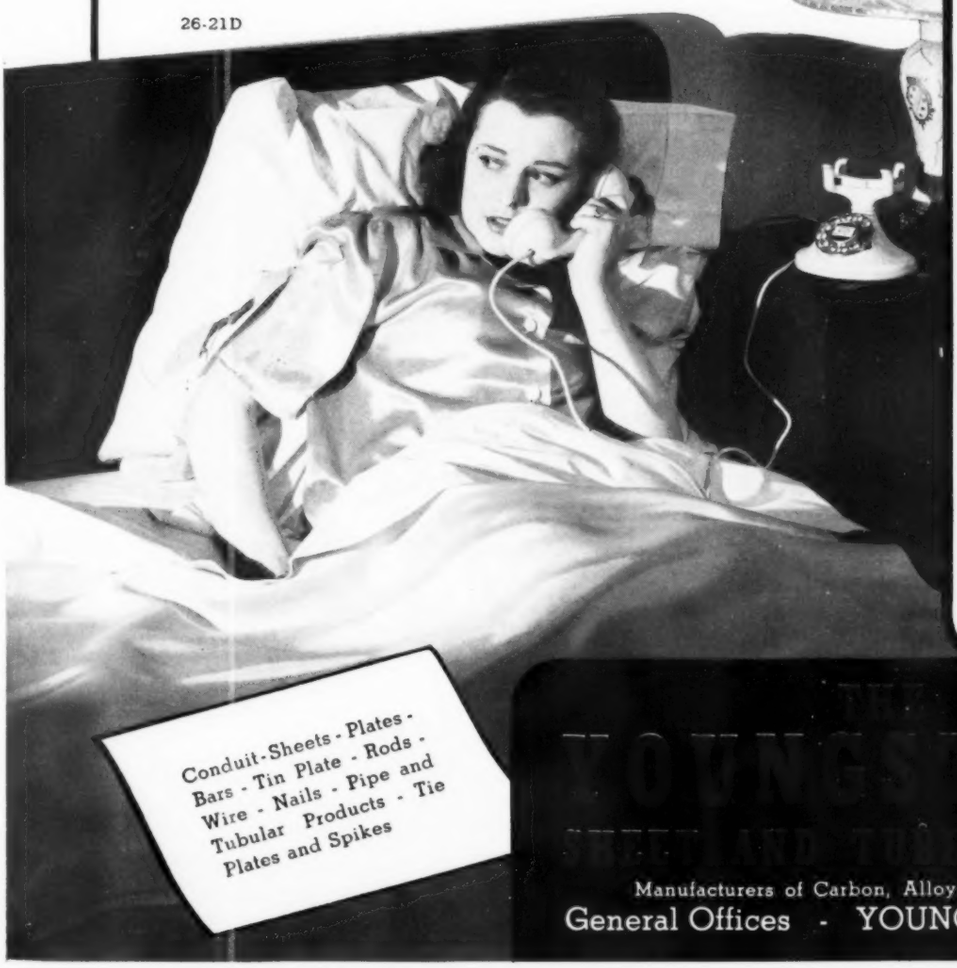
To make for better installation of that extra telephone which the owner of the new home is sure to want, remember to put in conduit while the house is being built.

Insulation, firestops, stud bracing or other building materials usually block up spaces in walls and under floors, making it impossible to conceal telephone wires after the house is finished. A few lengths of conduit and outlet boxes, properly located by the foresighted builder, will be worth many times their modest cost, in permitting quick installation of the extra telephone in the kitchen, den, upstairs hall, or bedroom.

BUCKEYE YOUNGSTOWN CONDUIT



26-21D



Conduit - Sheets - Plates - Bars - Tin Plate - Rods - Wire - Nails - Pipe and Tubular Products - Tie Plates and Spikes

THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon, Alloy and Yoloy Steels

General Offices - YOUNGSTOWN, OHIO

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LITE-FLO REFLECTORS by Sterling

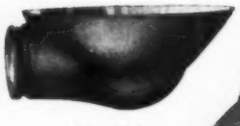

No. 701


No. 702


No. 703




No. 704


No. 239


No. 405

No. 255


Flood-O-Lite Senior



Silvered Glass Reflectors with the Exclusive Sterling Lite-Flo Stipple

FOR truly effective show window lighting, no method of light control approaches the efficiency of Silvered Glass Reflectors.

The Sterling Lite-Flo Stipple and other design features direct the light to the merchandise with minimum waste. Sterling methods of processing assure enduring lustre with practically unlimited service life.

Sterling Silvered Glass Reflectors are made in many types and sizes for all requirements of show window, cove and interior illumination.

Experience acquired in 20 years of service is available to contractors in laying out thoroughly modern lighting systems with highest efficiency. Just send dimensions and details.

RECESSED LIGHTING UNITS
Each unit includes Sterling Reflector, Holder, Socket, attractively finished Hinged Ceiling Ring, and Diffusing Glass for finished recessed installation.

FREE CATALOG
70 pages of display lighting suggestions, layout information, illustrations and description of Sterling Reflectors for every requirement. Write for your copy today.



SPECIAL REFLECTORS TO SPECIFICATIONS.
Where special shapes and sizes are required in quantities, Sterling Silvered Glass Reflectors can be made to specifications. Send details for quotation.

ENDURING LUSTRE
Sterling
TRADE MARK
SILVER PLATED GLASS
STERLING REFLECTOR CO.

STERLING REFLECTOR CO., 1435 W Hubbard St., CHICAGO

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HAZARD

ADEQUATE WIRING SERVES AND SAVES

THE *RIGHT* WIRE FOR EVERY ADEQUATE WIRING NEED





OKONITE and MANSON TAPES

. . . here are the finest tapes obtainable to finish the job right. They are unsurpassed in weathering and aging qualities . . . when properly applied are equal to the original insulation.

HAZARD, Type R . . . to be operated no higher than 50° C. Meets all requirements for "code" wire installations.

HAZARD PERFORMANCE, Type RP . . . operates safely at 60° C. which permits heavier current loadings or allows use of a smaller size conductor for a given loading.

HAZARD PERFORMITE, Type RH . . . the highest grade of building wire you can use. Temperature operation permitted: 75° C. Carries still greater current loads or, still smaller conductor sizes may be used to carry a given load. Installations show it is actually cheaper to use in a great many cases than Type R. Meets Federal Specs. J-C-106 and J-C-121.

HAZARD PERFORMITE, Small Diameter Wire, Type RHT . . . exactly the same as RH except it is smaller in diameter. The only type that may be used for both new work and rewiring. Available in sizes 14 to 8 inclusive and in full range of colors.

HAZAKROME, Type SN . . . the smallest diameter building wire. Permits high increase in electrical capacity by rewiring existing raceways. It has a synthetic, flameproof insulation with no braid. Comes in sizes 14 to 4/0, full range of colors.

HAZARD Watertite, Type RW. . . exceptionally tough and elastic. Very high dielectric strength and resistance; low specific inductive capacity maintained on long immersion in water. Approved for use in moist places instead of lead covered.

HAZARD Armored Cable . . . for remodeling jobs, use this cable with the ripcord for easy working. Made with a flame-resisting, moisture-proof paper sheath between conductor and armor.

HAZARD Flexible Steel Conduit . . . gives extra protection on short runs or where many bends must be made.

HAZARDEX Non-Metallic Sheathed Cable . . . a light, easy to handle cable with the full protection of a sheath. The economy and simplicity of HAZARDEX installations make it a popular selection for wiring within the limits of N.E.C.

A WEALTH OF EXPERIENCE of both HAZARD Workmen and Engineers is always available to you without obligation in working out some unusual wiring problem.

HAZARD INSULATED WIRE WORKS
DIVISION OF THE OKONITE COMPANY
Works: Wilkes-Barre, Pennsylvania • Offices in Principal Cities

HAZARD INSULATED WIRES & CABLES

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FOR DEFENSE — **WESCO'S** NATIONAL SERVICES AND STOCKS

OVERHEAD DEFENSE BEGINS UNDERGROUND



COURTESY OF U. S. NAVY RECRUITING BUREAU

Today many of America's great new air fields and naval bases are encasing their vital lighting and power lines in sturdy, long lasting Bermico underground fibre conduit.

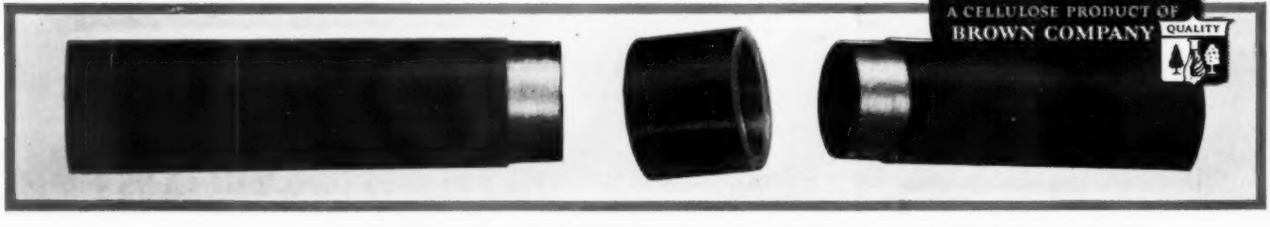
Civilian industry too, girding for defense, is putting its light and power lines underground. Public utilities and major industrial plants are insuring uninterrupted operation despite storms, floods and other dangers.

In these underground programs Bermico Fibre Conduit gets first call and rightly so. Bermico's virgin fibre composition gives it a toughness and durability that resists breaking from jolts and jars, and provides a permanent trouble-free installation. Bermico's light weight makes handling easy, facilitates laying up in the trench, speeds completion of the job.

Bermico Fibre Conduit meets all U. S. government specifications. Large factory inventories and ample stocks at WESCO branches throughout the country insure prompt service at all points. Use Bermico on your next job. Product of Brown Company, 500 Fifth Ave., New York, N.Y.

BERMICO*
FIBRE CONDUIT
A durable protective raceway for underground cables. High mechanical strength. Low water absorption. Easy to install.
* REG. TRADE MARK

A CELLULOSE PRODUCT OF BROWN COMPANY QUALITY



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WESCO OFFERS A COMPLETE AND SCIENTIFIC LIGHTING SERVICE FOR SPEEDING UP PRODUCTION



THE GIRL AT THIS INSPECTION TABLE inspected 408 units per hour with improper lighting (5 footcandles). When adequate lighting (50 footcandles) was provided the units inspected jumped to 458. In one 8-hour day she inspected 400 more units.

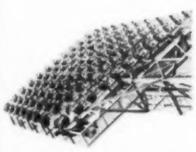
HERE'S ANOTHER EXAMPLE . . . A West Coast machine tool plant set a record of 33 per cent higher sustained production after the installation of a scientifically engineered Westinghouse lighting system.

DURING these times when more and more attention is centered upon ways of increasing production, lighting must be recognized as a primary essential to all work. But, speeding production with light demands *correct lighting,* scientifically fitted for each task.

Wesco not only offers you the trained services of Lighting Specialists but also a lighting job *complete in every detail from one source of supply!* Lighting fixtures, lamps, ballasts, transformers, and other auxiliaries are all soundly engineered, designed and built by one manufacturer, Westinghouse.

Moreover, Wesco is prepared to serve you regardless of the type of application, whether it be industrial lighting, floodlighting for factory protection or outdoor night work, commercial lighting for offices and stores, or modern street lighting for communities.

Each of the 79 Wesco Branches will be glad to assist you in determining the proper type of lighting to best meet your lighting requirements, to recommend the location of lighting units for greatest economy, to give you the latest information on flucrescent, incandescent, and other light sources, as well as many other important details. Why not phone the Wesco Branch nearest you? A complete listing is on the last page of this insert.



Bank of floodlights for large outside areas.



For protective floodlighting.



High Bay lighting unit.



Street lighting fixture.



Airport floodlight.



Industrial RLM fluorescent fixture.



Commercial fluorescent fixture.



Magnalux incandescent fixture.

Westinghouse Electric Supply Company

A NATIONAL DISTRIBUTING ORGANIZATION WITH 79 BRANCHES

WESCO at the "Ready" Everywhere



PHONE THE WESCO HOUSE NEAREST YOU FOR EVERYTHING ELECTRICAL

ALBANY, N. Y. 4-9135	HOUSTON, TEXAS Capitol 7272	ST. LOUIS, MO. Central 4838
ALLENTOWN, PA. 5105	INDIANAPOLIS, IND. Market 3301	ST. PAUL, MINN. Garfield 7441
ATLANTA, GA. Walnut 5806	JACKSONVILLE, FLA. 5-7246	SACRAMENTO, CAL. Main 3811
AUGUSTA, ME. 2040	LOS ANGELES, CAL. Vandike 1381	SALT LAKE CITY, UTAH 52972
BALTIMORE, MD. Plaza 0300	MADISON, WISC. Badger 4990	SAN ANTONIO, TEX. Cathedral 6216
BANGOR, ME. 6487	MEMPHIS, TENN. 8-4196	SAN FRANCISCO, CAL. Garfield 4120
BINGHAMTON, N. Y. 4-1364	MIAMI, FLA. 3-3143	SEATTLE, WASH. Eliot 7001
BOSTON, MASS. Hancock 7800	MILWAUKEE, WISC. Daly 1800	SIOUX CITY, IOWA 5-7634
BURLINGTON, VT. 1924	MINNEAPOLIS, MINN. Bridgeport 4137	SPOKANE, WASH. Main 3281
BUTTE, MONT. 2-1269	NEWARK, N. J. Mitchell 2-3450	SPRINGFIELD, MASS. 4-3101
CHARLOTTE, N. C. 2-3105	NEW HAVEN, CONN. 5-5154	SYRACUSE, N. Y. 2-6158
CHICAGO, ILL. Haymarket 2540	NEW YORK, N. Y. Walker 5-6000	TACOMA, WASH. Main 4134
CLEVELAND, OHIO Henderson 6000	NORFOLK, VA. 2-2366	TAMPA, FLA. M-5595
COLUMBIA, S. C. 8145	OAKLAND, CAL. Glencort 3177	TERRE HAUTE, IND. Crawford 1282
CORPUS CHRISTI, TEXAS 2-3351	OKLAHOMA CITY, OKLA. 2-7101	TOLEDO, OHIO Main 8101
DALLAS, TEXAS 2-2401	OMAHA, NEBR. Jackson 4674	TRENTON, N. J. 6122
DAVENPORT, IOWA 3-9966	PEORIA, ILL. 3-5111	TULSA, OKLA. 3-7155
DES MOINES, IOWA 4-8134	PHILADELPHIA, PA. Walnut 8950	UTICA, N. Y. 4-1194
DETROIT, MICH. Madison 8450	PHOENIX, ARIZ. 4-2144	WASHINGTON, D. C. National 9700
DULUTH, MINN. Melrose 2324	PITTSBURGH, PA. Atlantic 9100	WATERLOO, IA. 166
EVANSVILLE, IND. 7276	PORTLAND, ORE. Broadway 3667	WHEELING, W. VA. Wheeling 278
FLINT, MICH. 2-9149	PROVIDENCE, R. I. Gaspee 6484	WICHITA, KAN. 3-8215
FORT WAYNE, IND. A-3421	RALEIGH, N. C. 4141	WILLIAMSPORT, PA. Wmspt. 2-6184
FORT WORTH, TEXAS 2-1107	READING, PA. 7236	WILMINGTON, DEL. 6104
GRAND RAPIDS, MICH. 9-3105	RICHMOND, VA. 2-9071	WORCESTER, MASS. 3-7238
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Motor Shops

STRAIGHT-LINE ARMATURE RACK

Straight-line production methods are one of the features of the small motor department of the J & H Electric Company, Providence, R. I. To expedite the handling of armatures, the work table at the head of the armature winding machine is equipped with a rack to hold armatures waiting to be wound or those already repaired.

This simple rack consists of eleven 4-inch nipples of 1-inch conduit,



IN LINE waiting to be rewound or waiting for next step in repair procedure, armatures rest in this straight-line rack. Those in this illustration are ready to be tagged for shipment.

mounted by double locknuts to holes drilled in a length of 2-in. by 2-in. angle iron which runs the entire length of the table. The angle is bolted flush with the top edge of the table. Eight of these holders are mounted on 5¼-inch centers; the other three, for larger armatures, are on 6¼-inch centers. The rack will support armatures up to 1-inch shaft size and up to 1½ hp. size.

METAL CUTTER SAVES TIME

The latest addition of labor saving equipment to the motor repair shop of Central Armature Works, Washington, D. C., is the Duall Metalmaster. It is used for continuous metal shaping and contour sawing and filing of all types of metals and materials. The unit is complete with a complement of band saws and files.

The unit is so arranged that interior cuts can be made without cutting into the side of the metal. The band saw is cut and inserted into a hole drilled in the metal to be cut. The saw is then joined by a butt welding and electric annealing attachment on the side of the machine. When the cut is finished, the saw is again cut and the metal removed.

A job selector dial indicates the various types of saws and saw speeds to use for each type of material to be cut. The same data is given for the filing operation. The saws are furnished in 100-ft. coils and cut in 10-ft. lengths to fit the unit. A magnifying glass and auxiliary lamp attachment is used for fine, close and angular cutting.

According to H. J. Dorr, president of the company, this unit cuts the sawing and filing time in the shop by 60 to 75 per cent. Also, now they are able to cut slate, ebony asbestos, stacked mica and many other materials which, in the past, had to be cut by hand or sent out.



EFFICIENT CUTTING of all types of metals and materials is possible with this universal metal cutter. It increases the range of work done in this motor shop.

INSULATION CREASER

An ingenious device for creasing slot insulation to an accurate fit is used in the San Antonio Armature Works at San Antonio, Tex.

The device consists of a base, guide, crank and adjustable creasing wheels. The base is 24 by 12 inches. The guide



INSULATION CREASED to exact dimensions for forming into stator slots.

is adjustable over the width of the base and clamped in position. The crank operates a rubber roller and is geared to the creasing wheels above. The dull edges of the wheel may be set any distance apart within the width of the frame and the tension is adjustable.

Insulation is fed against the guide over the roller. The wheels sink accurate creases into the material where it readily folds to fit the slot opening.

PORTABLE WIRE STRIPPER

A totally enclosed cabinet type portable wire stripper has been built by the Warwood Armature Repair Co., Warwood, West Virginia, for use in their new small motor department.

A ½-hp. single phase motor, mounted inside the 20-in. by 23-in. by 36-in. steel cabinet is belt connected to two 2-inch diameter wire brushes, each 5-inches long and mounted vertically on top of the cabinet. The brushes are totally enclosed by a metal housing with just a small slit into which the wire is inserted. This guard can be removed to renew the brushes. A spring tension device actuated by a knob at the side of the brush housing permits setting the brushes closer together or farther apart to accommodate different wire sizes.

The cotton lint is drawn from the brush housing by a vacuum cleaner motor with nozzle and dust bag mounted inside the cabinet. A hinged door in the back of the cabinet provides access for the removal of the dust bag and servic-

PLASTIC TUBING FOR INSULATION

The use of IRVINGTON IRV-O-LITE XTE-30 and XTE-100 and KOROSEAL EXTRUDED PLASTIC TUBING for insulation is rapidly increasing. Wise manufacturers are realizing its distinct advantages in assembly, performance and low cost.



AUTOMATIC TRANSPORTATION USES IRV-O-LITE

The Automatic Transportation Company states that IRV-O-LITE XTE-30 is used for insulation between the terminals of their Rotor Brush Truck Controllers.

IRV-O-LITE and KOROSEAL have high dielectric strength, high mechanical strength, and hitherto unattainable resistance to tearing, abrasion, heat, fire, and solvents.

Manufacturing costs are reduced by the smooth inside surfaces and extreme flexibility which enable quick assembly on wire.

IRV-O-LITE XTE-30 & XTE-100 and KOROSEAL

Meet rigid electrical, chemical, and physical requirements. Test these tubings yourself. Let us know your requirements and we will send samples best suited for your use and with complete data on types and sizes.

Write Dept. 96

Irvington VARNISH & INSULATOR CO.

IRVINGTON, NEW JERSEY, U. S. A.

PLANTS AT IRVINGTON, N. J. and HAMILTON, ONT., CAN.
Representatives in 20 Principal Cities

Motor Shops

[FROM PAGE 117]

ing the motors. A toggle switch at the side of the cabinet controls both motors. The cabinet is mounted on four large casters, so it can be moved any place



***CABINET STRIPPER** for cleaning insulation from motor coils does a clean, quick, safe job and can be moved to any part of the shop.*

in the shop and plugged into a convenience outlet.

According to R. V. Thalman, president of the company, this piece of equipment not only saves time and does a fine job, but it is exceptionally safe since all moving parts are totally enclosed.

SIDEWALK HOIST

William C. O'Brien, who maintains a motor repair shop in Baltimore, Md., was faced with the problem of loading heavy motors on trucks which could only come within twelve feet of the shop. Since the intervening space was a sidewalk and hence a public thoroughfare, no hoist could be built that would obstruct pedestrian traffic.

The solution of the problem was the design and construction of a hoistway that could be rolled out over the sidewalk when in use and pushed flat against the building when not in use. The hoistway consists of a 6-inch I beam monorail, supported on the street side by two 3-inch channel iron uprights with a cross piece. These uprights rest on two wheels which are kept in align-

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STRAIGHT TEARING
HIGH TENSILE STRENGTH
HIGHLY INSULATING
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EASIER AND FASTER

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LIGHT, PORTABLE, EASY TO SET UP

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POWER TO BEND 1¼ TO 4½" PIPE

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ELIMINATE COST OF MANUFACTURED BENDS

Greenlee Hydraulic Benders are daily saving contractors on defense jobs from 15 to 75% on bending costs by slicing hours off bending time and cutting labor costs. To bend conduit requires power . . . approximately 31 tons for 4-inch conduit . . . and Greenlee Hydraulic Benders have the power. The No. 770 Bender for 1¼ to 3-inch conduit, has 25 tons of easily developed power, while the No. 775 Bender for 3 to 4½-inch conduit, has 40 tons of hydraulic power. There's a Greenlee Bender for every bending job . . . powerful hydraulic units for conduit and pipe, and small hand benders for steel, aluminum, and copper tubing.





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Find out how these benders, and other Greenlee Tools for electrical construction work, can help speed up your jobs . . . write for new catalog 33-E and new Bender Booklet S-116.

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Motor Shops

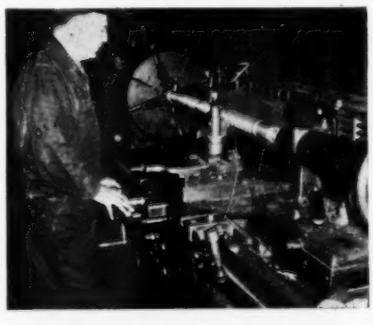
[FROM PAGE 118]

ment by a ¾-inch steel spreader bar, mounted between the channels just above the wheels. The main support for the building end of the monorail is an 8-inch I beam, mounted at right angles to the monorail and spanning a small areaway in the building. The monorail passes through the web of this large I beam. Pipe rollers, spanning the rest of the length of the areaway, help support the monorail when the hoist is retracted. The areaway, originally between two separate buildings, consists of two thick brick walls three feet apart.



***PULL-OUT HOISTWAY** solves problem of hoisting heavy equipment over a 12-foot sidewalk span, for this motor shop.*

The monorail provides about a three-foot overhang when the hoistway is fully extended over the sidewalk. The heavy equipment is rolled out of the shop on a dolly and hoisted by a two-ton chain hoist which rides the monorail. When not in use, the hoistway is pushed back into the building and the upright support locked to the alley door jamb. Doors enclose the opening between the two building walls.



***TURNING SHAFTS** for motor armatures is no novelty in the motor repair shop of Phoenix Electric Co., Youngstown, Ohio. Here the mechanic is making a 2¾-inch shaft, 49½-inches long, of high carbon nickle alloy steel, for a 31 hp. crane motor armature.*

Now...

AN EVEN BETTER, STRONGER, MORE UNIFORM CONDUIT

CENTRAL Rigid Steel CONDUIT



ABOVE: Spang CW, the uniform welded pipe, passing through the welding rolls. . . . here to become Central Rigid Steel Conduit.

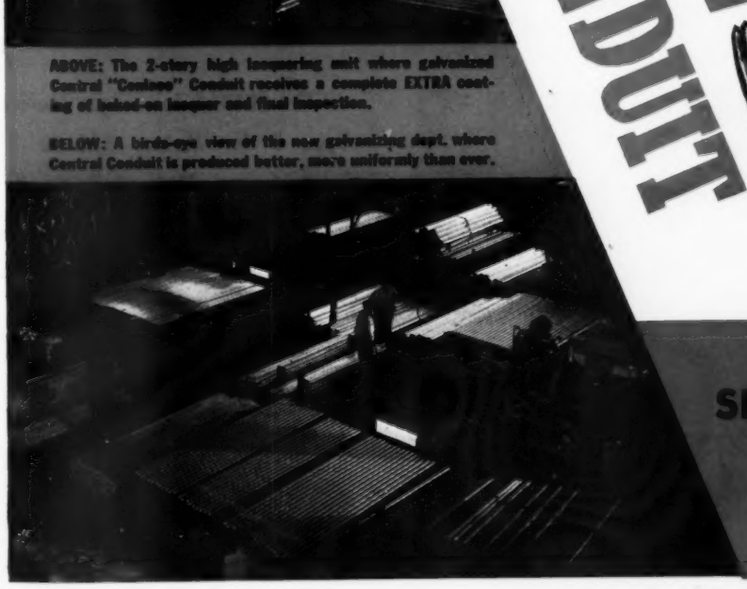


BELOW: Central Conduit is accurately threaded and reamed both ends simultaneously on latest type equipment.



ABOVE: The 2-story high lacquering unit where galvanized Central "Conlaco" Conduit receives a complete EXTRA coating of baked-on lacquer and final inspection.

BELOW: A birds-eye view of the new galvanizing dept. where Central Conduit is produced better, more uniformly than ever.





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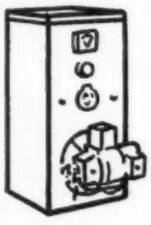
—to get more jobs done this year

(and next year too)

G-E MANUAL STARTERS

Protect Motors—Save Call Backs

You Wouldn't Install an Oil Burner without a Limit Control!



But installing a motor without adequate overload protection can be just as much a hazard to production.

No contractor who is seriously concerned about the successful operation of a motor would install it without *overload protection.* It's good insurance against burnt-out windings or overheated bearings that can cause costly production delays. Be sure the motors you install are adequately protected—

Use G-E Starters. They provide Isothermic Overload Protection.

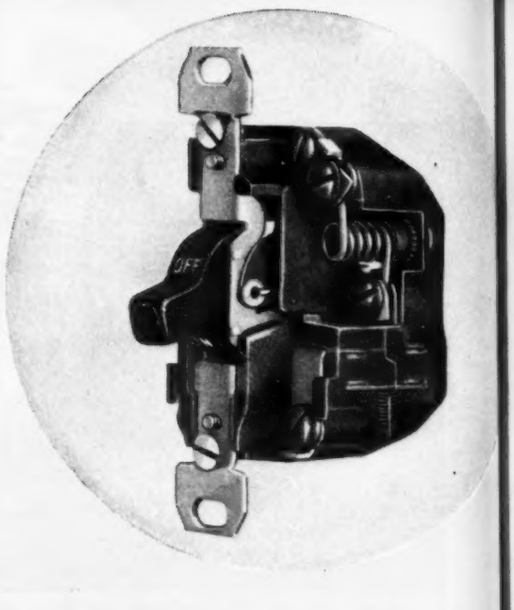
The CR1061 for Small Motors up to 3/4 Hp

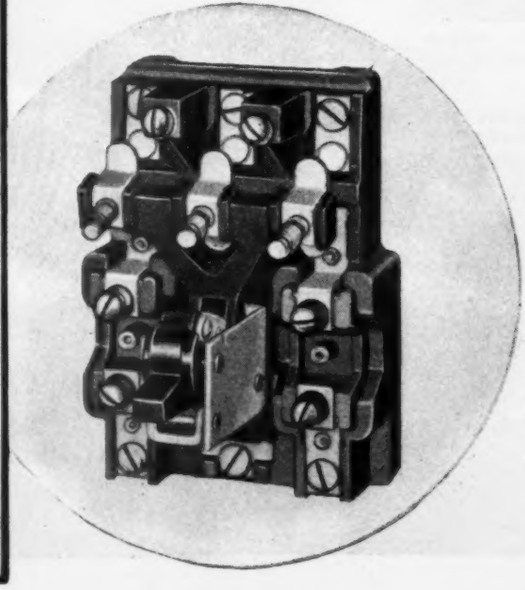
Switch element can be used with enclosure shown, or installed in a standard deep switch box.

Heater-type overload device, with heater selected to suit motor, protects against burnout.

Trip-free mechanism makes it impossible to hold contacts closed during excessive overload.

Long-lived, double-break silver contacts in arcing chamber provide adequate interrupting capacity.





The CR1062 for Larger Motors

Type B for Motors 3/4 to 2 Hp

Type C for Motors 2 to 5 Hp

Convenient terminals at top and bottom provide for line and load connections.

Double-break, fine-silver contacts separated by arc barriers to provide interrupting capacity.

Thermal overload device in two lines shuts motor down before it can become harmfully overheated.

Replaceable heater is furnished to suit characteristics of motor controlled.



THERE'S a world of difference between controlling a lighting circuit and controlling a motor. Here's why:

1. Low voltage does not harm lighting equipment, but may cause a motor to overheat.

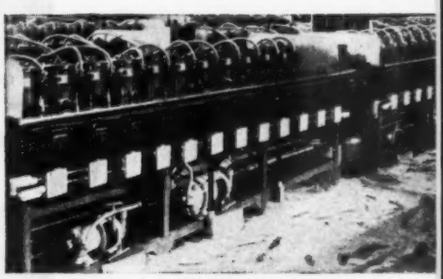
2. Failure of one phase of a polyphase circuit simply puts out lighting, but a motor continues to run severely overloaded.

3. Whereas lighting equipment *can't* be overloaded, excessive mechanical loads can cause costly damage to a motor.

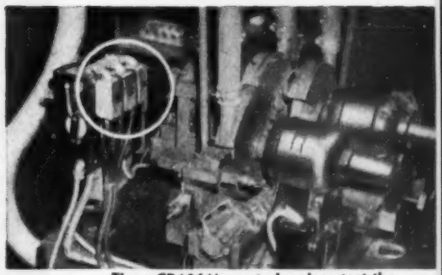
That's why successful contractors have found that it pays to put in motor control for every motor they install, large or small. It saves them "call backs" that are costly in time and customer good will, and it gives their clients a better job.

The two G-E starters shown above are simple, inexpensive motor controls for manual operation. They protect a motor against abuse and overload. And their heavy silver contacts are ample for interrupting the heaviest current a motor will draw (its stalled-rotor current).

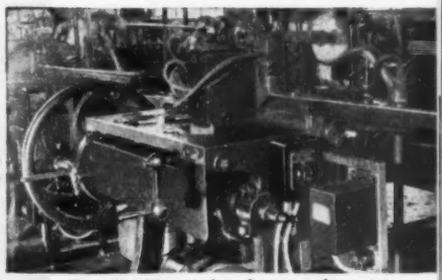
Protect the motors you install. Your nearby G-E distributor can recommend the correct starter. General Electric Co., Schenectady, N. Y.



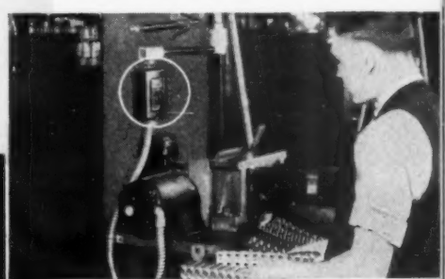
A convenient CR1062 controls each unit in this battery of drives "breaking in" sewing machines



Three CR1061's control and protect the motors on this centerless grinder



This CR1062 controls and protects the motor driving this automatic type-casting machine



The feed roll on this automatic punch press is controlled by the CR1062—the push button is for main press drive

GENERAL ELECTRIC

Estimating

COMPARATIVE LABOR COSTS

An analysis of the labor costs entering the construction of a home in the medium price brackets show electrical labor approximately one percent of the sale price of the project.

The home studied was a six room brick residence with tile bath, tile kitchen, tile powder room, recreation room in basement, cement back porch and gas heat. The sale price was $11,500.

The tabulation of labor hours and payroll amount in each trade is as follows:

Labor Cost

	Man Hours	Amount
Excavating	15.0	$17.98
Foundation	113.0	130.55
Sewer	50.5	58.97
Plumbing	121.5	206.55
Carpenter	643.5	998.43
Brick	369.0	520.30
Painting	191.5	317.83
Metal & Roof	61.0	97.78
Heating, Sheet Metal	58.5	99.45
Electrical	63.0	107.10
Lath & Plaster	258.0	376.10
Tile & Cement	245.5	297.79
Misc.	22.5	35.40

The total labor cost was $3,264.23 or 28.4 percent of the sale price.

NEW SERVICE EQUIPMENT

At a plant manufacturing steel products, the Premier Electric Construction Co., of Chicago, installed new service entrance equipment including a service cubicle, temporary feeders, lighting transformers and panelboards. Labor data derived from the work was listed to provide a check for estimating on similar work.

The plant was occupied and operating at the time the contract was carried out. Temporary feeders had to be shunted around the existing service facilities during removal and while the new work was being installed.

Installing temporary service conductors and temporary switch, removing existing service equipment ..... 18 m.h.

Setting up new service entrance cubicle with 800 amp. mains and one 400 amp., one 200 amp. and three 100 amp circuits... 7 m.h.

Installing new conduits and wires for six 500,000 c.m. service including connections at the main lugs of the entrance cubicle. 19 m.h.

Installing meter box, wiring, trim and ground connections ..... 9 m.h.

Rerouting conduits to the new cubicle and extending to a feeder for an adjoining building ..... 16 m.h.

Installing splice box and splicing to service conductors for new service..... 15 m.h.

Running two new 240 volt sub-mains to feed two 15 kva. lighting transformers, conduits, wires, fittings, boxes, hangers and connections ..... 29 m.h.

Installing and connecting two 15 kva. 240/120/208 volt transformers..... 27 m.h.

Installing and connecting two new panels, 30 and 20 circuits, mounted in existing cabinets ..... 32 m.h.

Removing temporary service and cleanup work ..... 4 m.h.

Total time on the above work was 176 man hours including an allowance for lost time, material handling, supervision and layout.

Data from Premier Electric Construction Co., Chicago, Ill.

SERVICE STATION FLOODLIGHTING

On a recent installation of floodlighting equipment for a gasoline service station, Lawrence Electric Co., electrical contractors, Yonkers, N. Y., kept an accurate record of the labor breakdown for future reference.

The work included the mounting and wiring of two 500-watt driveway floodlights, mounted on two 20-ft. steel poles, and two 300-watt mushroom type pump island units, mounted on two 10-ft. steel standards. Conduits from the new poles to an existing banjo pole sign were run under an existing finished stone gravel driveway and terminated in condulets just above grade level at the poles. Existing spare feeders from the station panel to the banjo pole sign were of sufficient number and capacity to carry the additional load. Type RW wire was used in all underground runs. Poles were set in concrete, those on the island being set before the island concrete was poured.

The following are the breakdown labor units:

SETTING POLES—includes assembling, setting and pouring concrete at the base of the four steel poles. The 20-ft. poles tapered



***POWER TOOLS** and welding equipment are prime needs for the contractor handling heavy industrial wiring, E. S. Disbrow, (right) and estimator W. D. Stoddard, (left) of the Tri City Electric Co. in Hammond, Ind. plan the tool assignment on every job for the most efficient operation from a well organized and equipped tool stock, including several power pipe machines, large conduit benders, 225 ampere welding sets, and power driven winches for cable pulling.*

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IMPERIAL PORTABLE

and

IMPERIAL WELDING CABLES



are doing their part in speeding up the defense effort. Covered with a TOUGH tire-tread jacket of highest quality mold-cured rubber, these cables are being increasingly used on welding jobs and for other work where tough, flexible cables are required.



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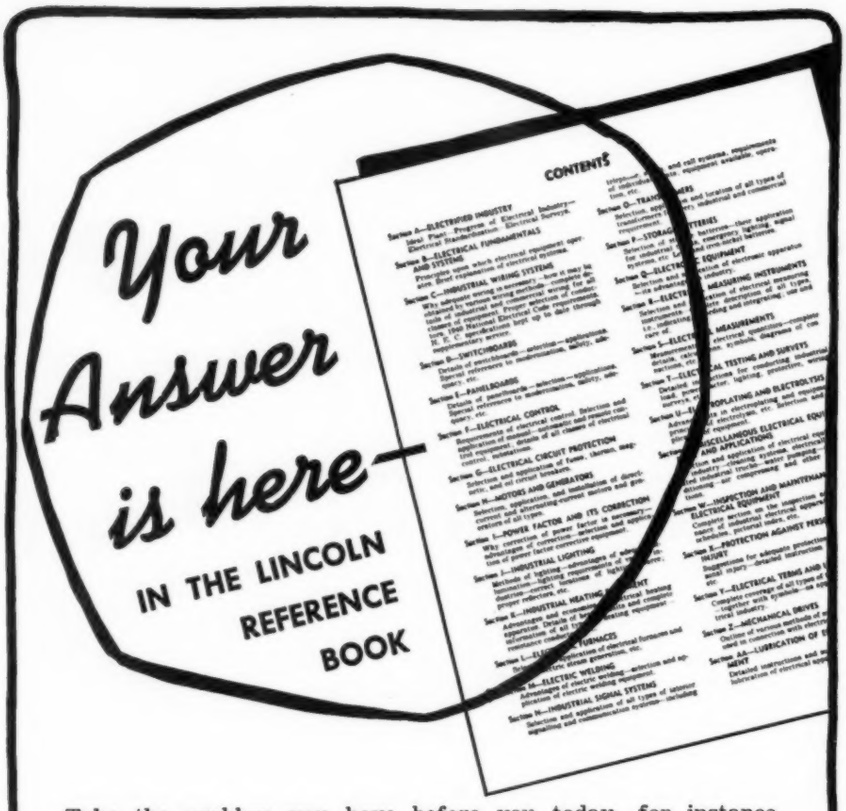
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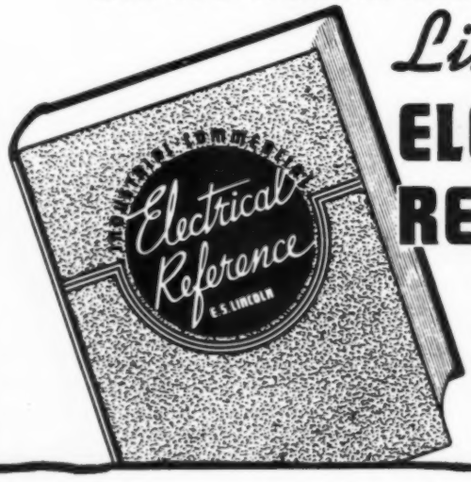
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To know that your next electrical installation will be planned with up-to-date practical information; that it will be the most economical method; that it will meet all requirements; and that installation and servicing difficulties will be avoided? What is it worth to have 1200 pages of factual data, and no advertising, 1200 illustrations, 326 diagrams, 315 tables and the complete Code all classified in 30 sections with a complete index and simple method of finding what you want?

The Lincoln Electrical Reference, compiled by E. S. Lincoln, Fellow A.I.E.E., at the request of leaders in the electrical field, is the result of four years of intensive effort. It is up-to-date now, and will be kept up-to-date by a supplementary service.

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Estimating

[FROM PAGE 124]

from 2½-in. to 1½-in. size; were cut in the shop and assembled on the job.

Total time ..... 2.5 m.h.

PULLING WIRE—includes pulling the underground type RW circuits, pole risers and making all connections and splices.

Total time ..... 2.5 m.h.

MOUNTING LIGHTING UNITS—

Pumping Island Units—includes mounting two 300-watt island lights on their 10-ft. standards and making all connections.

Total time ..... 1.5 m.h.
Avg. time per unit..... 0.75 m.h.

Driveway Units — includes mounting two 500-watt driveway floodlights on their 20-ft. steel poles and making all connections.

Total time ..... 2.0 m.h.
Avg. time per unit..... 1.0 m.h.

EXCAVATION—

Digging Holes—includes digging two holes, each 3-feet deep. No stone or rock was encountered.

Total time ..... 2.0 m.h.
Avg. time per hole..... 1.0 m.h.

Digging Trench — includes digging and backfilling a 215-ft. trench, 1-ft. deep. Stone gravel and loose rock in driveway had to be removed before digging could begin.

Total time ..... 12.0 m.h.
Avg. time per foot..... 0.056 m.h.

INSTALLING CONDUIT—includes the installation of conduit in the above trench and terminating in condulets at the poles. All joints were waterproofed. Distance from mushroom units to banjo pole was about 20 feet; and from driveway floods, about 85 feet.

Total time ..... 4.5 m.h.
Avg. time per foot..... 0.043 m.h.

SETTING CONDULETS—includes drilling and tapping eight ½-in. holes, two at the base of each light standard, and mounting a condulet on each pole. An electric drill was used for the drilling.

Total time ..... 4.0 m.h.
Avg. time per fitting..... 1.0 m.h.

MOTOR CIRCUITS

Installing motor circuits and lighting equipment in a new addition to an industrial plant provided labor cost data on a project where lost time, layout and supervision costs were relatively high because few of the operations were routine.

Starting at a point in the switchboard room a new three phase power sub-main for 97 horsepower at 460 volts was extended to a 200 ampere switch and a distribution panel containing two 100 amp., two 60 amp. and four 30 amp., three phase circuits on the North wall



3 PROFITS

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Teletalk
REG. U.S. PAT. OFFICE

Teletalk is 3-profit merchandise for the Electrical Contractor....

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- He profits from the sale of the materials used for installation.
- He profits from the work of installing the system.

Teletalk is easy merchandise for the Electrical Contractor to sell...

- It handles intercommunication jobs better —carries and amplifies the voice in natural tones without "parrot squawks" or other disturbing noises.
- It can be supplied with special facilities for every individual requirement—Annunciators, Handsets, Busy Signals, Paging Units, etc.
- It has established a reputation for quality through thousands of Teletalk Systems already in service.
- It is being promoted nationally with advertising and publicity directed to the contractors' potential customers.

The market for Teletalk is expanding rapidly as the need for efficiency makes greater demands on manufacturing, wholesaling, retailing, transportation, and the administration of public and private institutions.

The 3 Teletalk Profits are going to somebody —why not you? Send today for a Teletalk catalog and get this worthwhile business.

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WEBSTER ELECTRIC COMPANY, Racine, Wis., U. S. A. Est. 1909
Exp. Dept.: 100 Varick St., N. Y. C. Cable Address: "ARLAB" New York City

WEBSTER ELECTRIC

"Where Quality is a Responsibility and Fair Dealing an Obligation"

MANUFACTURERS OF TELETALK INTERCOMMUNICATION AND PAGING SYSTEMS • POWER AMPLIFIERS AND SOUND DISTRIBUTION EQUIPMENT • RADIO PHONOGRAPH PICKUPS • IGNITION TRANSFORMERS AND FUEL UNITS FOR OIL BURNERS

ILLINOIS

ALL PORCELAIN WIRING SYSTEMS . .

are Designed

FOR AND BY ELECTRICAL CONTRACTORS . .



OUTLET BOXES

Glazed and unglazed styles conforming to all existing standards of dimensions, spacing, position of knockout holes, and mounting screws. High mechanical and electrical efficiency.





SWITCH BOXES

Insure greater safety in wiring and the elimination of all grounding hazards. Made of best quality white porcelain. Metal inserts are placed in two holes of the switch boxes for receiving screws of standard switches, plugs, outlets, etc. Knockouts for single wires, also for cables. Specify and use them.



Illinois All Porcelain Wiring Systems give the contractor an opportunity to install a safe system quicker and better. One that is more adequate and insures permanency. It is the ideal system for practically all residential, commercial, and industrial needs and is particularly dependable where dampness and fire hazards are prevalent. Grounding is unnecessary when you use this system—no rusting or corrosion troubles are experienced. For that very next job make the installation with modern Porcelain.



TRADE MARK Bull Dog REGISTERED

Look for this Trade Mark



TOGGLE SWITCH PLATE

All porcelain with beveled edge and decorative pattern on face.



CLEATS

Standard one, two, and three-wire types.



STANDARD TUBES

In sizes ½ to 48 inches, 5/16- to 3-inch diameter in following types: unglazed, glazed, split, floor, split-floor, headless, curved end, crossover split, and crossover. Diameters all uniform both inside and outside.



KNOBS

Cement coated—nail—genuine leather-washer — code standard. They don't chip when driven in and they stay in place.

ILLINOIS

ELECTRIC PORCELAIN CO.

Macomb Illinois

ILLINOIS

...FOR TOP QUALITY

Estimating

[FROM PAGE 126]

of the building. Three of the circuits were used and the others left as spares for future connection.

From the distribution panel a circuit was run for one 30 hp. constant speed induction motor mounted at the ceiling. On an adjacent wall a disconnect switch and an automatic voltage reducing compensator were mounted with lead shields.

Another feeder was extended to two 15 hp. motors, one mounted on the machine and the other on the ceiling. These motors were protected by fused safety switches and hand-operated compensators.

A third feeder extended to the East wall for a 5 hp. motor on a rotary pump, controlled by a three pole safety switch and a magnetic contactor with push button operation.

The light wiring consisted of a submain for 7.7 kw. at 120 volts from a 60 amp. switch to an eight circuit multibreaker panel. Industrial fluorescent lighting fixtures were installed on 11 outlets and several convenience outlets installed near the machines.

The labor cost data on the work give the following man hours for each section of the project:

THREE PHASE, 460 VOLT, SUB-MAIN—

Safety switch, 2-in. conduit, condulets, ells, locknuts and bushings, pipe straps and hangers ..... 28 m.h.

1/0 wire, lugs and connections to switch and distribution cabinet..... 6 m.h.

Installing panelboard ..... 5 m.h.

RUN TO 30 HP. MOTOR—

1-in. conduit, safety switch, compensator, ells, condulets, flex connection, straps and hangers ..... 48 m.h.

No. 6 wire and connections to motor and compensator ..... 11 m.h.

Control wiring, 120 feet ½ in. and 2 No. 14 wires ..... 19 m.h.

RUN TO TWO 15 HP. MOTORS—

All work including conduit, wire, condulets, hangers and connections..... 52 m.h.

Circuit and connection for a 60-foot run to a 5 hp. pump motor..... 15 m.h.

Pilot control circuit for motor requiring 200 feet of ½-in. conduit including hangers and connections ..... 31 m.h.

LIGHTING FEEDER AND CIRCUITS—

S Switch and panel..... 6 m.h.

Conduit, boxes, hangers..... 45 m.h.

Wire, devices and fixtures..... 21 m.h.

All of the above figures include an allowance for supervision, lost time, handling materials and other labor costs which are applied proportionally over the work.

Data from Premier Electric Construction Co., Chicago, Ill.



TELL IT TO THE JUDGE

AND THE ANSWER WILL BE

SHAWMUT SHUR-LAG RENEWABLE FUSES

because they end production delays from inefficient fusing. The simplest, sturdiest, and most serviceable time-lag fuses made; the quickest and easiest to renew. The most economical to use, the most efficient in operation and protection.

Shawmut is the word for fuses; it has been made so by a superiority in engineering skill and craftsmanship devoted exclusively to electrical protective devices for nearly half a century. Shawmut renewal links are also in a class by themselves; they are uniform in thickness throughout their length, give correct time-lag without the use of welded plates, are the handiest and fastest to remove or insert. Ask your dealer or write for our Bulletin 400.



THE CHASE-SHAWMUT COMPANY NEWBURYPORT, MASSACHUSETTS

FUSE MAKERS SINCE 1893

through the scaffold platform. The man on the reel platform feeds in while other pulls the conductors.

33 To eliminate make-up time and expensive cable ends on a long pull of multiple conductor lead sheathed cables, it sometimes pays to have pulling eyes, made up at the cable factory, attached to each piece of cable.

34 Avoid the necessity of unreeling and measuring cable before pulling into the conduits by ordering the cable to exact lengths and with the three or four system conductors paralleled on the same reel. Thus only one, instead of three reels need be handled.

35 For pulling cables in cramped quarters, a compact portable power driven winch will eliminate much setting-up time and can be easily handled by a two-man crew. Direct-connect the winch through a gear box to a motor on the same platform.

36 To remove "baked-in" cables from conduits, drill holes in the elbows at the top of each conduit riser and pour a quart of kerosene into each conduit. After soaking for 48 hours the conductors can be removed with very little effort.

37 Ease feed-in operations on overhead pull boxes by placing pieces of fibre between the conductors and the edge of the box to act as a ramp for easy pulling. Fibre can be lubricated with cup grease for lead cables or soapstone for braided conductors.

38 In multi-story buildings take advantage of gravity by letting the weight of the cables help you in the pulling operation. Whenever possible feed in at the top and set up the pulling mechanism at the bottom.

39 Cable pulling can be hastened by setting up pulling equipment, and completing the operation before the working spaces become crowded with machinery or other equipment. Feeders can be installed with sufficient lengths left over to make connections to switchboards, panels and other equipment installed later.

40 Where numerous short branch circuit connections must be made to concealed heavy feeders, insert semi-flush deep connection boxes in the feeder conduit. Mount busbars, drilled and tapped for set-screw connections in the boxes and connect them to the feeder conductors.

E. EQUIPMENT MOUNTING

41 Rigid support of pre-set panels, switchboards and other equipment that is to be flush mounted in building walls or partitions can be accomplished by using angle or channel iron supports cast in the floor slab or clamped to floor steel by prefabricated clamps. The wall is then built around these supports. To pre-set surface panels on hollow-tile walls, equip the panel with four long-threaded L bolts which can be tiled-in when the wall goes up.

42 Where outlets, switches and other equipment are surface mounted on steel columns, considerable mounting time can be saved by using J-bolt, set-screw or flat-iron clamps which fit around the beam flanges. Drilling and tapping time is eliminated.

43 When numerous starters are located in a restricted working space and cannot be wall-mounted, often they can be conveniently arranged back-to-back on an angle iron or conduit rack with a common pull box overhead.

44 If large numbers of starters and controls must be wall-mounted and tapped off one heavy feeder, much time can be saved by using specially designed bus troughs. These are metal troughs with busbars drilled and tapped for branch circuit connections to nipped starters. Busbars are connected to the main feeder cables.

45 Control equipment located on round fireproofed columns, can be easily mounted on the removable covers of special junction boxes designed to fit the rounded surface of the columns. Conduit stubs and wiring will be concealed inside the box.

46 To quickly line-up rows of ceiling outlets, install the two end outlets, then stretch a heavy chalkline between them. The intermediate outlets can be quickly and accurately aligned for the roughing-in crew.

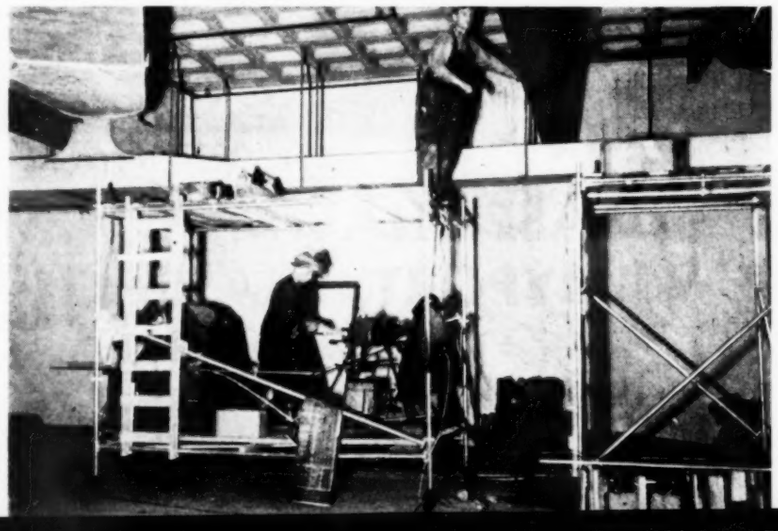
47 Outlet boxes can be securely fastened in column forms, by equipping all boxes, 4-gang and larger, with $\frac{3}{8}$-in. fixture studs. A $\frac{3}{8}$-in. nipple, extended from the stud through the wood form, is held rigid by a washer and lock-nut. Nipples and studs are removed when the forms come down after the pour is made and the concrete has set.

48 Where tandem outlets occur at the same riser height at several places in an installation, much aligning time can be saved by spot welding them to a common back strap of light channel iron for the roughing-in operation.

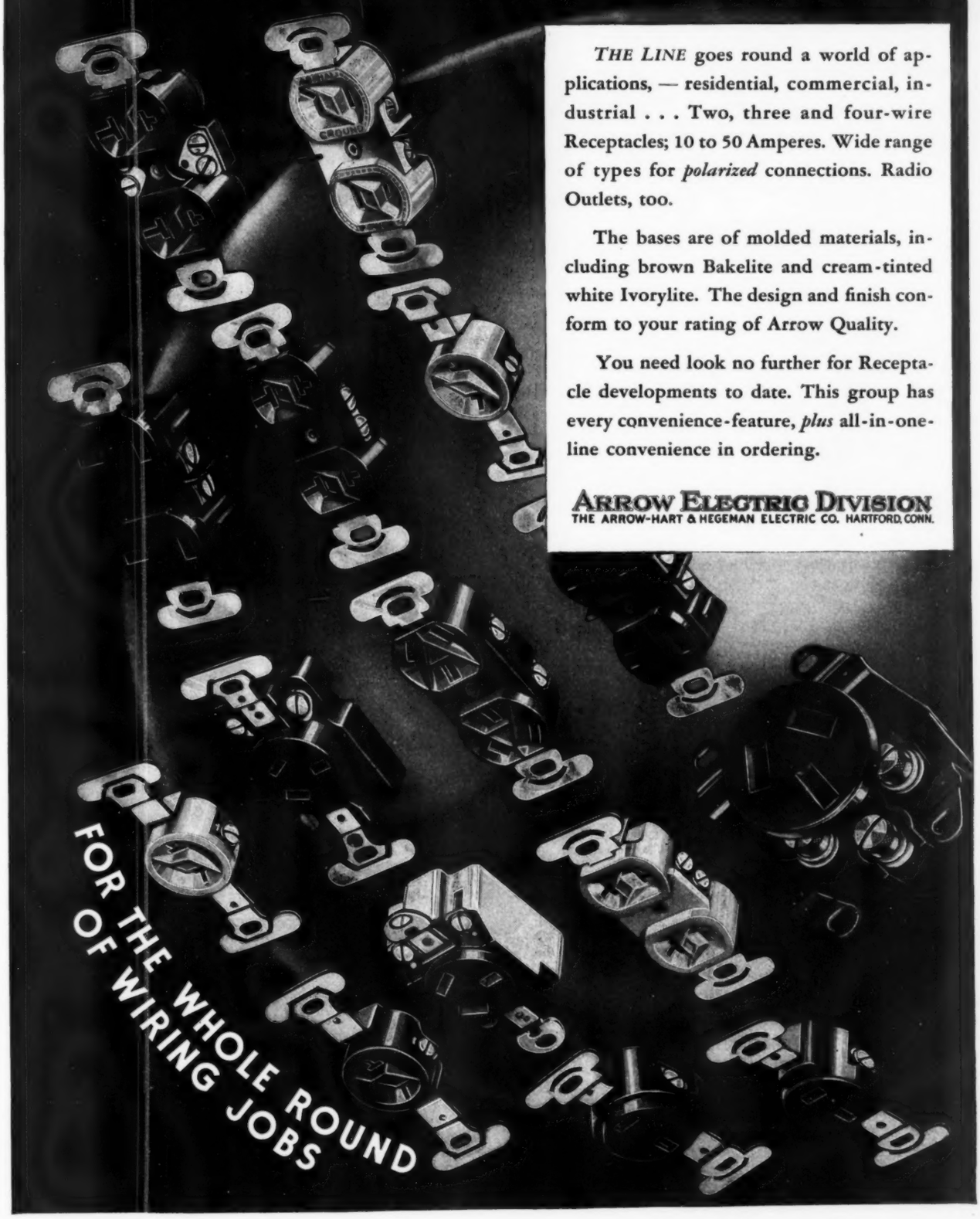
49 Ganged outlets often occur flush in fireproofed steel H-columns. Here the box and conduit can be mounted rigidly by using specially designed deep boxes. The backs of these can be fastened to tapped holes in the beam web. The fronts will be flush with the finished plaster.

50 Where newly erected switchboards and panels and other equipment are subjected to splashes of paint and plaster, much cleaning time can be saved by applying a fairly heavy coat of axle grease which can be easily wiped off later. Paint and plaster will not stick to the metal if grease is applied as soon as the equipment is set.

ROLLING SCAFFOLDS REDUCE *non-productive labor and facilitate conduit assembly and installation as well as branch circuit wiring operations.*



ARROW RECEPTACLES



THE LINE goes round a world of applications, — residential, commercial, industrial . . . Two, three and four-wire Receptacles; 10 to 50 Amperes. Wide range of types for *polarized* connections. Radio Outlets, too.

The bases are of molded materials, including brown Bakelite and cream-tinted white Ivorylite. The design and finish conform to your rating of Arrow Quality.

You need look no further for Receptacle developments to date. This group has every convenience-feature, *plus* all-in-one-line convenience in ordering.

ARROW ELECTRIC DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

. . . STEPPED-UP INDUSTRIAL
Building Calls for

LATROBE

FLOOR BOXES and WIRING SPECIALTIES!

They

- REDUCE INSTALLATION TIME and SAVE LABOR COSTS!
- PROVIDE USERS WITH TROUBLE-FREE SERVICE . . . A "MUST" FOR VITAL DEFENSE INDUSTRIES!
- GIVE MAXIMUM SATISFACTION, BOTH NOW and LATER!



No. 284 Duplex Receptacle Nozzle

Compact and neat. Available with 1½" and ¾" brass pipe extension. Also LATROBE Duplex Telephone Nozzles.



No. 252-R Two Gang Box

Adjustable floor box with No. 208 Receptacle in one section. Cover plates have ½" and 2" flush brass plugs.

In the current drive for greater defense production, industry is building millions of additional square feet of manufacturing space . . . and they're calling on you to provide adequate wiring for these new factories in the shortest possible time . . . a situation that definitely calls for LATROBE Floor Boxes and Wiring Specialties.

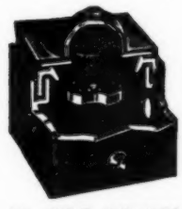
Every LATROBE item *saves you installation time,* and in doing so, *saves on labor costs.* They're designed and built to make speedy installation a certainty. Next, the assured quality of LATROBE products means long, trouble-free service for your customers. Every LATROBE user benefits from this built-in superiority . . . a particularly valuable characteristic *now,* when defense production *must* keep going. Then, the LATROBE features of flexibility of use and all-over efficient operation assure maximum satisfaction that will prove valuable to you when old customers again decide to build.

These many LATROBE features are truly applicable under today's conditions . . . it will pay you to get the complete LATROBE Floor Box and Wiring Specialty story. A letter to us today will bring complete details by return mail—write!



No. 330 Latrobe Tom Thumb Utility Outlet

For use in wood installations and other locations free from moisture or mechanical injury.

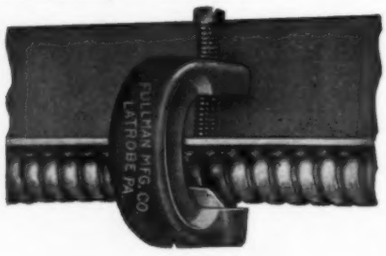


No. 251-R Adjustable Gang Floor Box

Similar to No. 130 round cover box, except sides are flat for additional conduit holes. Furnished with No. 208 receptacle and 2" flush brass plugs.

No. 480 "Bulldog" Armored Cable Support

Light weight and strong, for supporting or hanging cable from any angle. Easiest, most economical method of temporarily or permanently installing armored cable.



Latrobe Adjustable Watertight Floor Boxes

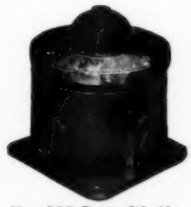
Underwriters' Approved boxes with 3½" and 4¼" cover plates. Quickly and easily installed in concrete or wood finished concrete floors. Top of box adjusted to set level with floor.



No. 120 Box with No. 206 Stem Nozzle



No. 140 Box with No. 206 Nozzle



No. 150 Box with No. 207 Nozzle

FULLMAN MANUFACTURING CO.

LATROBE • • • PENNA.

Industrial Electrification

ENGINEERING · INSTALLATION · MAINTENANCE

POWER ECONOMY

SAVE power; conserve material; reduce time; increase production—Words? Yes. But significant ones that hold the keys to efficient plant operation. Somehow, it takes some form of an emergency, such as the National Defense, to instigate check-ups to reveal power leaks and inefficiency.

Saving power doesn't mean curtailing its use on productive machinery. Far from this, it means bottling up the existent electrical and mechanical power leaks. It means reclaiming that constant unnoticed trickle of power used up as reactance loss in low power factor circuits; dissipated as heat in overloaded conductors; lost in long drive-shaft assemblies or in overmotored machines. It means reorganizing production schedules to permit staggering large power consumption periods.

"How can this be done?" the management asks. And the plant electrical man and engineering staff reply by making a thorough check-up on the electrical and production systems in an effort to locate points where wasted power can be conserved. Where and how to look for such "pilfered power" is discussed in the following pages. For the electrical maintenance man's convenience the Check Chart lists ways to use and conserve power.

Previous articles covered—

1. Simplifying Electrical Maintenance
2. Preventive Maintenance of Distribution Systems
3. Preventive Maintenance of Electrical Equipment
4. Reducing Power Costs
5. Maintaining Good Power Factor—Part I
6. Maintaining Good Power Factor—Part II
7. Meeting Severe Service Conditions
8. Eliminating Causes of Severe Service Conditions
9. Providing Adequate Capacity for Increased Demand
10. Electrifying Operations to Reduce Unit Costs
11. Safety Protection for Electrical Operations
12. Increasing Flexibility of Electrical Service
13. Electrical Aids to Automatic Control
14. Electrical Ways to Reduce Waste
15. How to Save Power (this issue)

Future articles will discuss—

16. Protection Against Sabotage
17. Electrifying for Continuous Operation
18. Improving Working Conditions
19. Electrical Aids to Quality Control
20. Electrified Plant Housekeeping

HOW TO SAVE POWER

IN these times, saving power may have different meanings in different places. Had you been in the Southeast this past Spring, the order to save power would have meant saving energy in order to conserve what little water remained behind the dams. In certain other areas the same order would have meant reduce demand, for generating capacity was limited though fuel was plentiful.

Keeping demand and energy use at a minimum for effective production is now considered a patriotic duty because it permits adding more defense activities. The plant operator gains in reduced power cost or increased efficiency.

The two problems are inter-related. Lower demands will usually follow a lower use of energy, but it is also easily possible to reduce demands without greatly affecting the use of energy.

The common quick method of conserving capacity is to stagger the load. Good managers do this where practical as a matter of good business. Power-factor correction is a major item in releasing distribution and generating capacity and also saves energy as will be shown later.

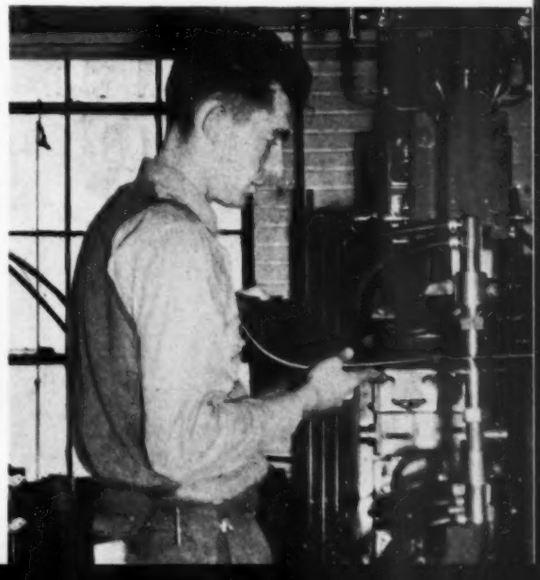
Another and somewhat more difficult task is to counteract the sudden power surges normally incident to welders, or arc furnaces, or such users as refrigeration equipment of short operating cycles. The use of stored energy welders, and the addition of capacitors to many other similar units, will avoid high current inrush and make available much distribution and generator capacity formerly needed for these low power-factor operations.

In spots where air conditioning is needed for relatively short cycles only, the use of stored refrigeration will permit the use of smaller compressors with lesser demands during the normal running hours, and operating more hours off-peak.

Start with Lighting

As an example of more effective use of power, consider fluorescent lighting. Lighting levels in most plants, except the very newest, are much below that point at which the workman produces best with fewest mistakes. Fluorescent lighting gives more lumens per watt than does incandescent. It therefore offers a good method of increasing the foot-candles of illumination without increasing the use of energy proportionately. In a hypothetical case, raising the foot-candles from 10 to 40 by use of

WELDING with stored energy saves power. This 40 kva. Sciaky spotwelder, according to the airplane manufacturer using it, produces a weld equivalent to a conventional 350 kva. welder. The demand charge is lowered because there is no heavy inrush of current and power factor of unit is very high.



fluorescent lighting might double the energy consumption for lighting. This higher level of illumination might reduce seconds and rejects sufficiently to increase net plant production by three per cent. Since the total power cost is usually less than three per cent of the cost of the finished product, increased production through doubling the lighting energy may offset the total power use.

Fluorescent lighting, however, is not a panacea for all lighting ills. Proper selection of colors is important for some applications. The reds and yellows in incandescent lighting add qualities sometimes needed and also appear to make it more brilliant than fluorescent at the same lighting level. The cost of fluorescent fixtures is still much higher than fixtures for filament lamps. This increases fluorescent fixed charges, making the overall cost high where energy rates are low. Corrected power-factor units should always be used, more particularly where stroboscopic effect may be detrimental. Stroboscopic effect will be further reduced if adjacent units operate from different phases.

Saving with shorter time cycles

Another example of more effective use of power is in the many applications for induction furnaces. Because of control, rapid heating, and the ease of application, production may be greatly speeded up. In this way, the energy per unit is reduced although the total may have increased. Still another example is the use of infra-red electric heating for many baking and drying operations. Frequently, the time cycle is so shortened that the total use of heat energy is reduced. The overall improvement in plant efficiency often makes the electrical energy used in the heating application of minor importance.

All such items as the addition of conveyors, electric trucks, various other handling devices, changing machines over to automatic operation, increasing machine speeds, and multi-unit machine operation will undoubtedly add to the use of power. They will also add to the productive capacity of the plant. By adding productive capacity they become power savers on a unit or complete plant basis.

Losses in distribution

Cutting down on the number of kilowatt-hours wasted in the plant calls for a survey of conditions and progressive corrections as points of loss are found. Naturally the most glaring faults should be corrected first. Many heavy losses may be found on the electrical system, and many equally bad conditions in mechanical operations.

Major power losses on the electrical distribution system will be high resistance grounds and short-circuits, overloaded circuits, and local heating. Low resistance grounds and short-circuits are bad while they last, but they clear themselves quickly through blown fuses or tripped breakers. High resistance grounds and short-circuits, on the other hand, may carry over for long periods of time and waste much power because of the regularity of the current flow. For grounds, a detector may be installed. Only a careful check will disclose the short-circuit. In any event, fairly frequent and systematic testing should be done to keep the circuits clear.

Overloading circuits is simply making heating elements of the conductors. Space heating from this source is very expensive. Protection from excessive overloading is secured easily by proper setting of the breakers or by proper fuse size. This should be insisted upon. And in no case should jumpers be permitted to keep a circuit in operation when the fuse or breaker will not carry the load.

Overloads may be caused by the addition of too many current consuming devices, in which case, additional circuits possibly should be run. Too often, however, the overload is caused by poor power factor. Before a new circuit is installed to relieve an overloaded one, power factor readings should be taken. If low power factor should be the cause of the overload, corrective measures should be taken before more copper is installed.

Local heating at the various connections along the line causes much waste of power and much voltage loss. In one instance recently noted, the line drop in a d-c control circuit was cut from 28 volts to 10 volts when silvered contacts replaced the ordinary copper-to-copper ones. Few persons realize the number of connections which are made on a circuit from the point where it enters the plant to the point where electrical power is applied. Each of these connections is a potential source of local heating. This is particularly true of spring jaws on switches and fuse clips, and of the hinge joints of knife switches. The number of blown fuses attributed to overloads, but actually due to local heating, must be tremendous if the experience of some few individuals is typical. Inspection should be made periodically to insure clean surfaces and firm contacts.

Distribution systems

Under today's operating schedules many plants have outgrown their electrical distribution systems. Although simple reinforcement might help rectify the condition, it will be better to study the problem as a whole. Load centers have frequently changed through addition of new buildings, conversion of warehousing areas into production, or relocation of major production units. This may have left lighter loads on heavy feeders and put heavy loads on lighter ones. A review of the distribution system should first determine the location of load centers, their magnitude and probable growth. Maximum future loads should be established as accurately as possible and necessary capacity provided. If the distances are great, or the loads heavy, consideration should be given to transmission, and some use at higher voltages. Since line loss is a function of current and not voltage, higher voltages may reduce conductor size and losses sufficiently to make transformers a very profitable investment.

Distribution panels should be located as close as possible to load centers and



INDUCTION HARDENING *of compressor crankshafts at Fort Wayne Works of General Electric saves current over former method. Motor load on the m-g set is considerably less than the heating load for carburizing and reheating for quenching.*

MAINTENANCE GUIDE SHEET

ELEVEN STEPS TO IMPROVE EFFECTIVENESS AND REDUCE WASTE OF POWER

CHECK LIST	WHY OR HOW
EFFECTIVE USE OF POWER	
1 LIGHTING	
Sufficient intensity	Speeds production—improves quality—reduces rejects.
Correct position and quality	Reduces eye fatigue—maintains production and quality.
2 ELECTRIC HEATING	
Inductive or infra-red	Reduces time cycle—improves quality.
Placed in production line	Saves handling—reduces non-productive time.
3 POWER-DRIVEN MACHINERY	
Material handling	Saves labor—saves time—reduces spoilage—saves floor space.
Speed-up machines	Increases production—cuts unit power use.
Automatic machine operation	Saves labor—reduces idle machine time—increases production.
Multi-unit machines	Production continues during setting up—cuts idle machine time—reduces unit labor and power.
ELECTRICAL LOSSES	
4 CIRCUIT DIFFICULTIES	
Grounds	Check periodically with volt meter—may cause consistent losses.
Short-circuits	Check with ammeter or magneto—may cause consistent losses and operating difficulties.
Overloading	Check for temperature—increases line loss—lowers voltage.
Local heating	Arcing contacts—causes low voltage—wastes energy—increases maintenance—blows fuses.
5 POWER-FACTOR LOW	
Circuit capacity	Uses capacity—causes overloads—increases line loss.
Correction by remotoring	Conserves capacity on total distribution system—cuts line loss on all circuits—improves voltage.
Capacitors	Helps on distribution system from connection point to power source.
Synchronous motors	Carry live load—improve distribution voltage and reduce line loss from motor to power source.
6 MOTORS	
Loads	Raise efficiency by full loading—shift motors to heavier duty—cut line loss by higher efficiency and power-factor—buy smaller motors.
Load cycle and overload capacity	Use smaller motors overloaded for short periods—keep average loads high—change load cycle to keep motors small.
Correct motor speed	Low speed motors less efficient—high speed motors less costly—gearmotors for low shaft rpm.—run wound-rotor motors full. Vertical motors instead of angle drives—flywheel effect for pulsating loads—high torque for hard starts.
Correct type	
7 DISTRIBUTION SYSTEM	
Adequate capacity	Large cables—load center distribution—ring bus—multiple. Reduce line loss—uses smaller conductors—use high voltage units—correlate transformer capacity to load.
High voltage	
8 CONVERSION TO DIRECT CURRENT	
Minimize capacity	Use DC only where necessary.
Efficiency of units	Rectifiers or converters for fluctuating loads—M-G sets high efficiency only at full load.
9 CONSERVING CAPACITY	
Welders, etc.	Use capacitors—properly designed units.
Fluctuating demands	Stagger load—correct operating cycles.
Power-factor	Insure good condition by proper motoring—add capacitors—corrective equipment.
MECHANICAL LOSSES	
10 GROUP DRIVES	
Drive shafts	Keep small groups—eliminate jack-shafts—reduce bearing pressures.
11 EQUIPMENT	
Fans	Insure inlet and outlet size—reduce outlet friction.
Pumps	Leaks—friction head—packing—impeller design.
Air compressors	Pressure correct—leaks—needless use.
Refrigeration units	Head pressures—cooling water.

be kept as free as possible from dust and dirt. If power factor is still low after proper motoring, capacitors may be located at the load centers, or some large motor be made synchronous to provide corrective capacity here.

Provision should be made for easy relocation of power users. The various types of bus distribution combine this flexibility with high current carrying capacity. Should the loads be in large units, but somewhat scattered and intermittent, a ring bus may be most adaptable. This bus might be fed from two or more banks of transformers to insure better voltage conditions for all units.

Ample provision should be made for lighting and lighting voltage equipment. If this is of large proportion, a four wire three phase system may be best suited for combined lighting and power loads.

Correct motorization

Underloaded motors probably represent the greatest power loss on the electrical system of the plant. It is characteristic of a-c induction motors that both the efficiency and power factor curves rise to a maximum at or near full load. At low loads, both curves drop off very rapidly. While overmotoring serves the commendable purpose of making ample power available for the task, it leads to a marked increase in the unnecessary losses sustained. If consistent over-motoring lowers the average efficiency of the plant system by only five per cent, it represents an increase in preventable losses by that same amount. It increases the motor cost, requires heavier wiring, and makes the bill larger.

Losses from low motor efficiency occur at the motor. Losses from poor power factor occur in the distribution system. Low efficiency and low power factor both increase the current flow in the line where losses vary as the square of the current. Thus an improvement in efficiency and power factor will greatly reduce line losses, warranting even slight betterments in operating loads.

A careful survey of all motor loadings, and the load cycles on the various motors, should be made periodically. Knowledge of actual load as compared with motor capacities may permit adding load to many units, or may allow motors to be shifted into heavier duties. The cost of the shift may be saved by the lower cost of new small motors bought in place of larger ones.

Motors are designed with inherent abilities to carry extreme overloads for short periods of time. Where load cycles have short periods of high demands and longer periods of low loads, the overload capacity should be utilized by using smaller motors, hence keeping load close to the motor rating. In some cases it may be possible to vary the operating cycle, as has been done extensively in the refrigeration industry, to capitalize on these motor abilities.

Power factor correction may also be attained through use of synchronous or static condensers and through the use of synchronous motors operating at leading power-factors. However, remotoring should be examined first, and applied wherever practical.

Other examples of motor misapplication include use of the wrong type for the task. The higher speed motors have higher efficiency and power factor



PROFITABLE CHANGEOVER *from steam to group and individual motor drive was accomplished by the Sewall Paint & Varnish Co., Kansas City, Mo. Constant speed of operation, savings in friction losses from old belts, pulleys and line shafts, overall lower operating costs are some of the results.*

curves than slow speed ones. Use of gear head motors may improve such a condition. Operating wound-rotor motors at less than full speed should be avoided. The addition of a flywheel on pulsating loads may permit the use of a motor with better characteristics. Vertical motors should be considered in place of angle drives and bevel gears for vertical drives. Motors may be secured today to operate in any position and thus avoid complicated drives which use much unnecessary power.

Conversion

Where conversion to direct current is necessary, excessive loss may exist. A careful survey of the d-c load cycle should be made, and conversion equipment selected which will operate at the highest efficiency at the charted loads.

Rectifiers are economical in price at higher voltages and have nearly uniform high efficiency curves at all but the lowest loads. Converters, being in effect two machines in one, have higher efficiency at low loads than have motor-generator sets. Transformer losses must be added in each case.

Motor-generator sets operate at the resultant efficiencies of the motor and generator units. Since each has relatively low efficiency at low loads, it is essential to economical use that they be operated regularly at loads as close as possible to the highest point on their efficiency curves. If low loads occur frequently over long hours, savings will warrant the purchase of a smaller set for use during those periods.

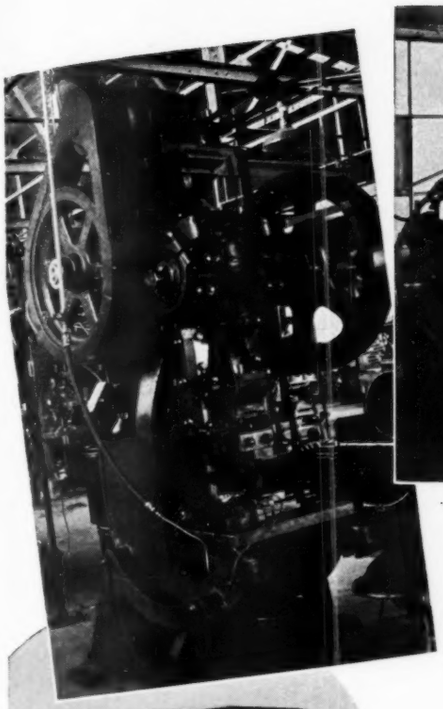
One common fault in many older d-c plants now having a-c supply is the continued use of direct current for lighting, heating applications and motor operations where a-c units are equally or better suited. Since conversion losses may be anywhere from 6 to 40 per cent, a changeover to a-c units offers an immediate opportunity for power savings. Putting lighting and heating units on a-c supply usually can be done with a minimum of time and expense. A program of motor change can be carried out over a period of time without great cost or effort.

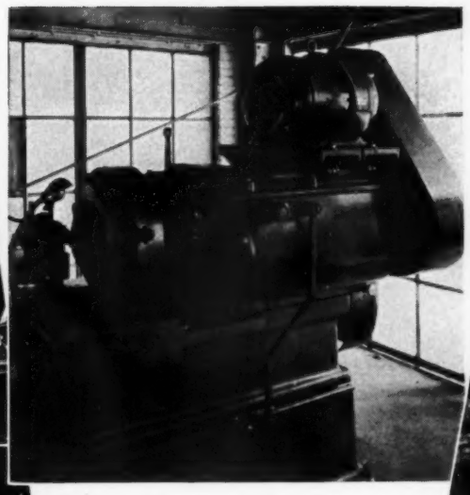
Mechanical Power Losers

The duty of the electrical man may not include correction of mechanical faults which waste power, but the cause of a great many overheated motors and blown fuses will be found in the mechanical load. When a motor, once properly installed begins to give trouble the mechanical equipment which it drives should be investigated and correction started from that point.

Group drive, for example, is an efficient method of transmitting power in many cases but watch that it does not get out of alignment. Fan applications may waste power because the inlets get clogged and hence the rated capacity of air is no longer delivered. Excess power is often required to drive pumps because of leaks in underground piping. In one discovery of this character new piping reduced the pump running time from 40 minutes per hour to 7 minutes per hour.

Power is the common denominator of all factory operations. So many possibilities for improvement exist in the average plant that any individual with a mind alert to opportunities by new methods and the knowledge of where to look for waste may find himself considered a genius because of effective savings made in the use of power.

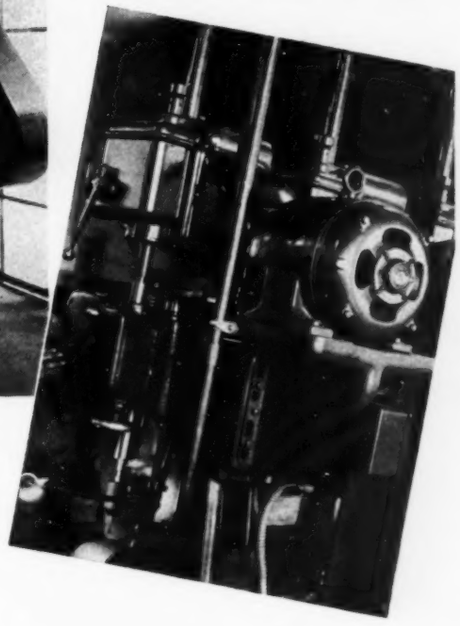


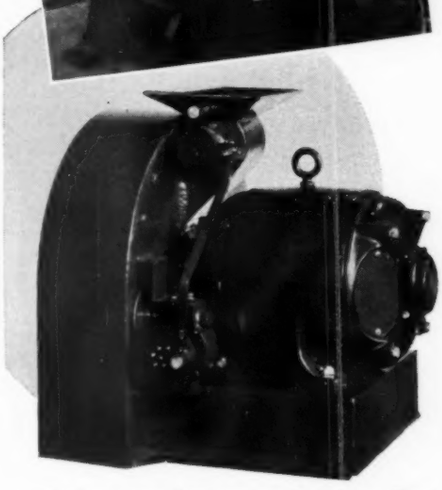


(Above) Century 10 horsepower motor driving a lathe.

(At left) Century motor driving a punch press.

(Below) Century 3 horsepower Squirrel Cage Motor driving a gang drill.





Century one horsepower Repulsion Start Induction motor driving a feed grinder.

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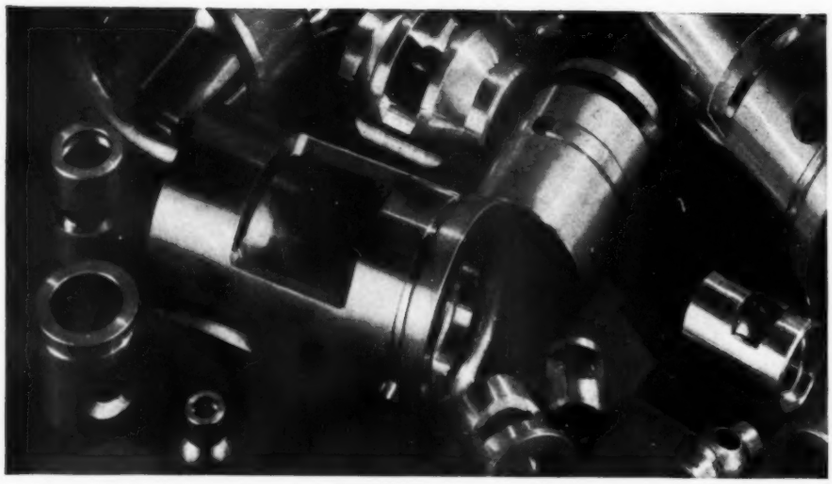
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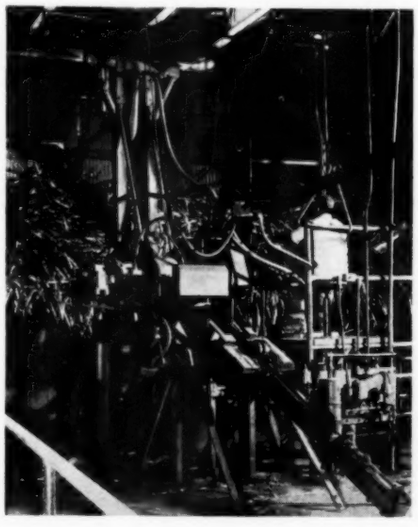
A heavy object often is difficult to move, so that it is easier to take machines to it for certain operations than to transport it to the machines. Portable electric equipment with flexible shaft drives are becoming popular for this class of work.

Grinding, sanding, wire-brushing and polishing tools for heavy castings are common examples. In addition, many types of assembly work lend themselves to the use of equipment with flexible drives. One very useful application is in the production of radio sets, where power screwdrivers and socket wrenches save time and secure uniform tightness.

Another somewhat similar operation is the tightening of screw caps to bottles or other containers as they come from filling machines. In both cases, the motor may be mounted in an overhead position and the driving shaft of the tool suspended from above.

Motorized Unloader Speeds Production

Motorization of an unloader that removes sugar cane from cars as it is brought from plantations of the Oahu Sugar Co., Ltd., Waipahu, T. H., now



***TOUGH SERVICE** on this motorized sugar cane unloader requires the motor to start 750 times per hour. Motor has withstood almost continuous operation for 18 months with only minor maintenance requirements.*

enables one operator to do the work in a straight 8-hour shift that two men formerly did working alternately one hour each.

The boom that rakes the cane off the car is operated by a drum with a direct-connected Westinghouse 7½ hp.

gearmotor driving it. Elevation and traverse of the boom are controlled by air cylinders. Before motorization, the boom was operated by slipping a belt on reversals; raising, lowering and swinging were accomplished by brute force.

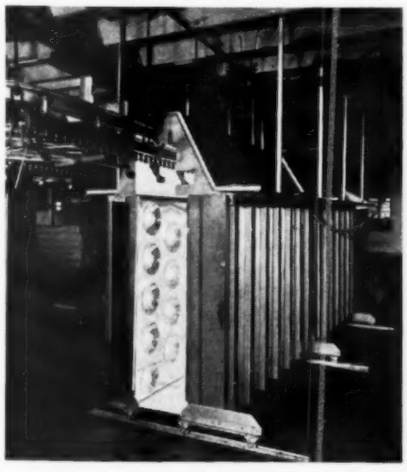
Motor operating cycles in this application are extraordinarily severe. By actual count, the boom moves in and out with 750 starts per hour, some 70 per cent of which are reversals. The machine has been operating 24 hours a day, six days a week, for a total of 18 months without maintenance, except for minor adjustments and repair of the brake. This reduced maintenance, labor savings, and increased speed made the motorization of a second unloader economical.

Drying Lamps Speed Production

Smooth flow of production through the enameling section of the Forest City Foundries' Niagara furnace division is now being maintained by using infra-red heat for drying furnace sections.

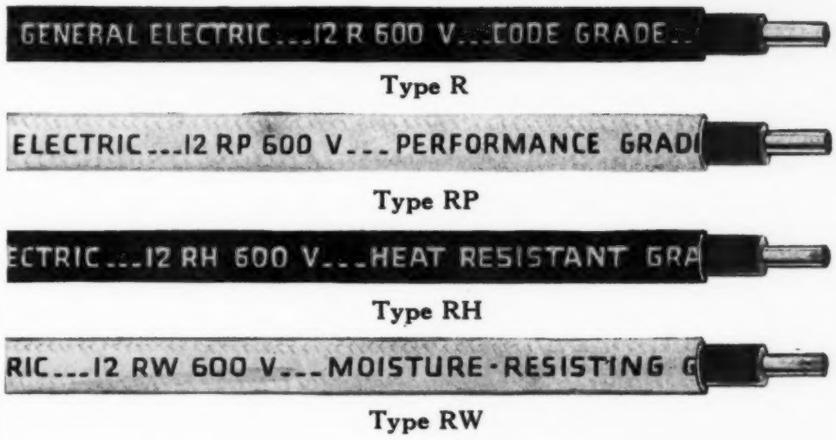
Originally, it required 30 minutes or more to dry the paint on certain pieces of work and consequently production was retarded. Now the drying time has been reduced to about 8½ minutes and a tougher, harder, more uniform baked-on finish is produced.

The infra-red drying oven used consists of 128 250-watt drying lamps in 10-inch gold-plated reflectors and arranged in four banks of 32 lamps each. Each side of the enclosed oven is made up of two banks of reflectors mounted on channel iron tracks to permit variation of the distance between the lamps and the work passing through the oven on the conveyor.



QUICK DRYING of enameled finishes in this manufacturing plant is accomplished by using an adjustable tunnel made up of four banks of infra-red drying lamps.

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GENERAL ELECTRIC

Reader's QUIZ

QUESTIONS from readers on problems of industrial equipment, installation, maintenance and repair. Answered by electrical maintenance engineers and industrial electrical contractors out of their experience. For every question and every answer published, we pay $5.00.

TO WARM AIRPLANE ENGINES

QUESTION 23—Aircraft engines are still hard to start in cold weather. My idea would be a large 3 phase 230 volt blanket or to place strip heaters under the engine cowling large enough to warm the engine for starting with convenient connections into pits on the flying field and a means of controlling electric heat from underground cable distribution. Has anybody a better idea that will help this situation without hazardous means or excess weight to the plane? Portable steam and air blower ideas will be appreciated.—V.A.L.

A. TO QUESTION 23. In most instances the use of an electric blanket would be the most satisfactory means of keeping an airplane engine warm. The blanket could be made circular with a drawstring on the outer edge so the blanket could be drawn up tight around the cowling behind the engine. The outer side of the blanket should be well insulated so the heat transfer will be in to the engine and not to outside air.

Hot air could be used also by having a blower force air, heated by strip heaters within a duct, onto the motor. This method would require a blanket or tarpaulin to enclose the motor and retain the heated air around the motor.

There is on the market too an airplane oil immersion type electric heater which was designed for and used by airplane transport corporations for preheating airplane crankcase oil in the motor to make it unnecessary to wait for the engine to warm the oil before "take off."—R.C.M.

A. TO QUESTION 23. I would suggest the possible use of radiant energy, supplied by infrared heat lamps, to warm the engines. Radiant heat can be directed, reflected, or refracted just the same as light radiation. The reflectors with their lamps could be mounted on a structure in such a manner that radiant energy would cover the entire motor. Underground distribution with convenient places to attach the cable of the portable structure could be easily provided. —V.M.

PRECIPITATOR PROBLEM

QUESTION 24. At a carbon plant, where gas is burned, the "soot" is collected with precipitators, at 55,000 to 75,000 volts. How can the unidirectional voltage go through the precipitators and get back into the a.c. with a power factor? We have a 440 volt, 3-phase a.c., transformer, a mechanical rectifier which is a semi-synchronous motor and a set of charged wires hanging between plates which are about four inches from the wires. So that leads to another question. Would this act as a condenser even though it is practically direct current? — H.D.M.

A. TO QUESTION 24. It would act as a condenser because the precipitation of dust is accomplished by the use of an electrostatic field. The current used is not unidirectional, as we ordinarily think of direct current, but is a pulsating direct current produced by the mechanical rectifier. Your rectifier is probably of the commutating type which closes and opens a circuit in synchronism with the applied alternating current to the device. Therefore only part of the applied wave is utilized. Usually the same line that supplies the transformer, which furnishes the high voltage current to the rectifier, operates the synchronous motor. This keeps the equipment in phase.—V.M.

A. TO QUESTION 24. The voltage furnished for precipitation is unidirectional and dependent upon the alternating voltage. The unidirectional voltage sets up an electrostatic field around the conductors. This field causes ionization and represents actual energy, which must be furnished originally by the a.c. There is no electrical connection between them, however, but there is an electromagnetic linkage. The unidirectional voltage does not actually get back into the a.c. with a power factor. It merely reacts on the alternating current.

The voltage impressed on the transformer 440 volt primary is an alternating voltage of conventional wave-form. The secondary induced voltage is directly dependent on this wave-form and follows the same pattern. A mechanical rectifier changes it into a unidirectional pulsating voltage. This voltage is impressed on the precipitator and, is actually, still the induced alternating voltage, although it is unidirectional with respect to the precipitator electrodes. The wave form of the pulsating voltage causes a leading charging current to flow through the transformer secondary. Its primary, therefore, represents a load with a leading power-factor The precipitator acts like a poor condenser. The condensive properties depend upon the medium to be precipitated, the voltage and characteristics of the electrodes.—O.A.

FLUORESCENT-RADIO TROUBLES

QUESTION 25. Can a fluorescent lighting fixture of reputed make be definitely accused of causing radio interference and noise when installed properly on a polarized and grounded system? Will twenty such fixtures increase amount of noise very much more than only one or two? If so what is the remedy?—B.E.S.

A. TO QUESTION 25. Yes, a fluorescent lighting fixture may cause radio interference, because every electric spark may radiate some energy at radio frequencies. If



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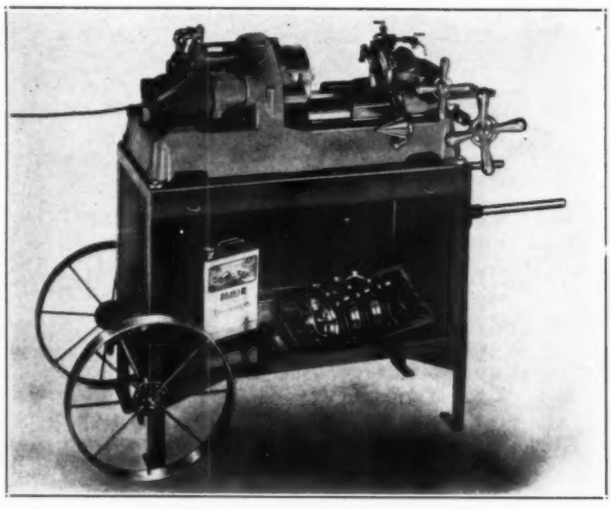


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Reader's QUIZ

[FROM PAGE 140]

all 20 were sources of trouble the noise level would be greater than that caused by one or two. One remedy is to place two condensers in series, across the supply line to the lamp ballast, with their midpoint grounded. The ground lead should be short and well grounded and attached to the frame of the device causing trouble.—V.M.

A. TO QUESTION 25. For all practicable purposes, such as broadcast reception, no trouble will be met, if the radio receiver is not nearer than seven or eight feet to the nearest lamp. In a manufacturing plant with over 600 fluorescent lamps in one room for general illumination, radio reception is carried out without any interference from the lamps. In another plant, however, a radio manufacturer could not use fluorescent lamps to light a shielded radio test booth, due to radio interference from the lamps. Radio interference does not seem to be cumulative, that is 10 lamps or more would cause only slightly more than one lamp.—G.H.H.

A. TO QUESTION 25. The mercury arc of a fluorescent lamp causes sputtering action on the lamp electrodes which sets up a continuous series of radio waves. Twenty lamps would compare to 20 small radio transmitters, and increase the radiation and interference. These direct radiation waves will not cause interference if the aerial is at least 10 feet from the fluorescent lamps.

Interference caused by line radiation or line feedback from the electric supply line can be eliminated by a line filter at each lamp. This filter is of the inductive capacitor type having a current carrying capacity equal to the load of the lamps in the fixture.—R.C.M.

CHARRED CABLE

Q *UESTION 26. I have hooked up over 40 welding machines using 3-wire No. 4 BX for 20 hp. a.c. machines. One morning upon starting, I noticed the armored cable on one machine all charred. After cutting the BX off from the machine and substituting another piece of the same make, it hasn't charred. After pulling the wire from the BX we found that the insulation on the wire wasn't*

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damaged. Now what caused the armor to get all black and red hot?—H.F.

A. TO QUESTION 26. It is assumed that BX armor serves as the equipment ground. It is possible that the operator was welding on a grounded object, that his welding ground was not firmly fixed to the work and that the welding ground cable is grounded at the machine. The electrode would then pass current to the ground, then through the cable armor to the generator and consequently heat up the armor. I have seen flexible cable burned up by the operator inadvertently passing welding current through it. I would suggest checking for grounds at the machine. We use large "C" clamps instead of plates for grounds.—R.E.G.

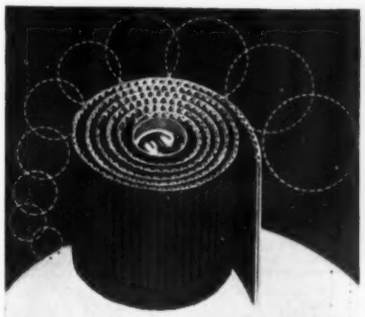
A. TO QUESTION 26. I recently had this same experience and found that the operator had accidentally let the BX come in contact with both electrodes of the machine. Not having enough resistance to withstand such a heavy current, the BX became red hot and then turned black but it did not stay hot long enough to affect the wires. I now use a 3-wire No. 4 rubber covered cable and have found it highly satisfactory besides ending my trouble.—E.E.H.

A. TO QUESTION 26. An arc welding machine connected with a piece of BX for the motor power supply, would also have its frame grounded through the steel armor of the BX. In addition one of the welding generator leads is also grounded. Therefore, if the electrode holder should be accidentally knocked against the welding machine or laid on top of it, while the machine is in operation, the entire welding current of the generator would be conducted to the ground, through the steel armor of the BX. This would cause the steel armor to get black and red hot.

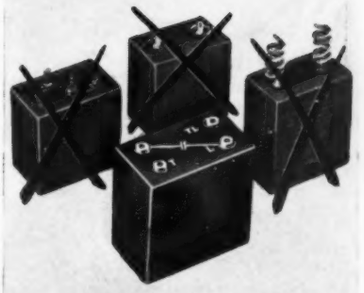
A similar condition would occur if a four conductor portable cord was used instead of the BX. The fourth wire, being used to ground the machine frame, would get hot and possibly burn off all its insulation, without any apparent damage to the other three wires. A good way to avoid this trouble is to use an insulated welding electrode holder.—G.H.H.

A. TO QUESTION 26. The trouble could have been caused by an a.c. ground; or by welding current flowing through the BX from grounded work to a ground in the generator or return lead. We have all

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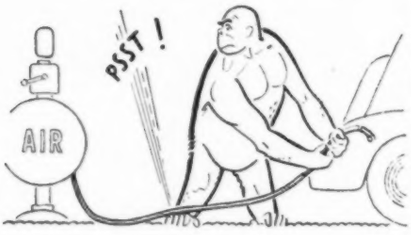
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Reader's QUIZ

[FROM PAGE 143]

metal portable welders and there has been several times that welding current did not return through the lead, but returned through the work, or through grounded work to a ground in the machine.

Most of this was due to causes beyond the control of the operator.—L.S.W.

Can You ANSWER these QUESTIONS?

QUESTION Z—A traveling cleaner uses a one hp. capacitor blower motor and a ¾ hp. traction motor (repulsion-induction). The tendency is to change this over to 3-phase. This is a simple matter on the capacitor motor but what about the ¾ hp. RI motor. It is a gearhead motor and is impractical to use a motor of a different frame.—T.L.T.

QUESTION A1—What is the formula for determining current carrying capacity of monel wire and busbar operating at 1000° F? According to the Electrical Handbook, monel conductivity is four per cent of copper. This being so, please state how one manufacturer of heating units gives 10 amperes for No. 14 wire and 30 amperes for ½-in. by 0.032 busbar. This carrying capacity is apparently based on about 50 per cent of copper.—J.O.H.

QUESTION B1—I have a 5 hp. 220-volt motor operating in a damp place in a creamery. The insulation resistance to ground has dropped to .4 megohms (400,000 ohms). The motor operation is normal. Should this motor be taken out and rewound?—C.L.B.

QUESTION C1—What size transformers are required to supply 440-volt power, to 12 spot welders rated 3-75 kw, 1-150 kw, 3-15 kw, 1-25 kw, 2-17 kw, 1-10 kw and 1-12.5 kw. The 75 and 150 kw are equipped with automatic timing range 5 to 12 cycles. At present these are supplied from the regular 3-phase power supply, welders staggered on phases. Can we use single phase transformers to feed welders and avoid the difficulty of balancing phases and to isolate welders from the regular power circuits? It is my idea to separate these welders from the regular power system.—R.C.P.

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Questions ON THE Code

Answered by
F. N. M. SQUIRES
Chief Inspector New York Board of Fire Underwriters

Wires of Different Systems

Q. *"I have always ruled that it was wrong to pull the 24 volt thermostat control wires in the same conduit with the 110 volt circuit for the fan or motor circuit on a gas furnace control wiring job, am I right?"—B.Z.*

A. In the past, under the provisions of the National Electrical Codes previous to the 1940 issue, the 24 volt thermostat control wires could not be installed in the same raceway or enclosure with the 110 volt wires inasmuch as the two sets of wires were supplied from transformers having different maximum secondary voltages and were supplied from different transformers.

But the 1940 Code has changed that and now provides that if *all* of the wires are insulated for the maximum voltage of any conductor in the enclosure, they may be installed in the same conduit or enclosure. (See Section 3013).

If, however, the control wires are not insulated for the maximum voltage (for instance if they are of the annunciator wire type) then they must not be run in the same conduit.

Motor Feeder and Service Cable

Q. *"I have a voltage drop problem on a fire pump installation. The motors are 200 feet from the service, there will be four 5 hp. motors, 230 volts, 3 phase, to be fed by this feeder. What size feeder should I use? Our power factor is 92 percent. I would like to use Parkway cable for feeder and bury it where it passes some buildings. Is it approved by the Code for feeders?"—E.S.*

A. A 5 hp. phase, 230 volt motor is rated at about 15 amperes. The feeder therefore should have a capacity of 425 percent of 15 amperes (for the four motors) or approximately 64 amperes and should be capable of carrying this for 200 feet with a loss of not over 3 percent or 6.9 volts.

This feeder should therefore be of No. 2 type R or No. 4 type R.P. or R.H. wire.

Service entrance cable approved for use underground may be used as a feeder from a master service to another building if the final outer covering of the cable is non-metallic.

If the feeder does not run from the master service cabinet but originates at a distribution switchboard then all three of the conductors must be insulated.



***HOT IDEAS** were traded in heavy conference as W. J. Varley, of the Electrical Contractor Ass'n. of Northern California, returning to San Francisco from a visit to busy Washington, visits J. Walter Collins of the Chicago Electrical Contractors Ass'n. High spots in the discussion were San Francisco's successful commercial rewiring campaign and Chicago's contracting research activity.*

Low Voltage Wires

Q. *"What are the limitations regarding the use of annunciator wires, or other wires which are not recognized by the Code, when used for the wiring of low voltage, Class 2 control systems as covered by Article 800? The particular system in mind makes use of a 50 volt-ampere transformer with 8/16/24 volt secondary voltages and the nameplate specifies that the current is limited to 2 amperes maximum at any voltage." —O.H.S.*

A. The fineprint note to 8002a states that Class 1 systems are regulated by other Codes.

Section 8006 governs Class 3 systems and in Section 8006c covers conductor insulations.

Section 8007 governs Class 4 systems and by reference to Chapters 1, 2 and 3 requires the regular types of insulation such as rubber covered wire, etc.

This leaves a lack of requirements for insulations to be used on Class 2 systems which would imply that there are no requirements for the kind of insulation to be used on the wires for this class.

This is further strengthened by the fineprint note following 8012 which states that, "The conductors referred to in this section (8012) would ordinarily be insulated but *except for class 1, 3 and 4* systems, the kind of insulation is not specified as reliance is placed on the protective device to stop all dangerous voltages and currents."

Therefore, where the source of current is from primary batteries or from transformers having current limiting characteristics (bell ringing transformers) or where the current is limited by the small fuses as specified in section 8003 (1 to 5 amps.) the use of annunciator wire or any other type of wire will be permitted.

E.M.T. and Cinder Concrete

Q. *1. "We refer to Article 3482 of the National Electrical Code relative to the use of E.M.T.*

"Where E.M.T. tubing is run exposed on the face of cinder block partitions are there any special precautions that have to be taken? In other words, is it a violation to run the tubing in contact with the cinder block partition?" —M.A.E.

A. It is doubtful that the Code intends to prohibit the use of electrical metallic tubing from being run on the face of a dry partition wall of cinder concrete where the wall is not an outside wall, nor is in a basement, and is



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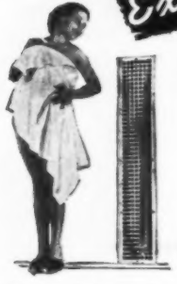
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Questions on the Code

[FROM PAGE 145]

dry before the installation of the tubing.

But where there is any moisture present or to be expected in cinder concrete, electric metallic tubing should not be used.

There will be noted a little difference in the rules pertaining to rigid conduit (3463) and electrical metallic tubing (3482) which is undoubtedly due to the difference in wall thickness of the metal.

Q. 2. *"Also where E.M.T. is run exposed in a basement and passes through walls constructed of cinder blocks of 4-in. or 6-in. thickness, are there any special precautions that have to be taken to prevent the tubing from coming in contact with the cinder blocks?"—M.A.E.*

A. 2. Where the E.M.T. passes through cinder concrete walls in a basement, the tubing should be protected on all sides by at least 2 inches of non-cinder concrete.

OFFICIAL INTERPRETATIONS

by the

Electrical Committee of the N.F.P.A.

Interpretation No. 184

QUESTION... Was it not the intent of the Electrical Committee at its meeting December 4-8, 1939 at Atlantic City, N. J. to permit Types R, RH, and RW wire to be used for the rewiring of existing raceways using the same percentages of conduit area fill as was permitted for small diameter building wires, namely 60% for one conductor, 40% for two conductors and 50% for three or more conductors, this during its discussion and actions upon Sections 3466, 3487, and Table 11?

ANSWER... No.

Interpretation No. 185

QUESTION 1... Does Section 3362 permit the installation of non-metallic sheath cable in the hollow spaces of cinder block walls when installed at the time the wall is being constructed?

ANSWER... No.

QUESTION 2.... Does Section 3362 permit the installation of non-metallic sheath cable in the hollow spaces of

cinder block walls if the cable is fished in after construction of the wall?

ANSWER. . . No.

Interpretation No. 187

QUESTION. . . Would a meat box compartment of a commercial refrigerator installation be included in group (7) of Section 3362 of the 1940 edition of the National Electrical Code as one of the locations in which non-metallic sheathed cable shall not be installed?

ANSWER. . . Yes.

Interpretation No. 188

QUESTION. . . Does Section 2110 of the 1940 edition of the National Electrical Code contemplate that a floor outlet may be counted as one of the receptacle outlets required?

ANSWER. . . The intent is that receptacle outlets shall be placed at the borders of rooms in or above the baseboard. Floor receptacles to be counted in the total of the required number shall be located close to the walls.

Interpretation No. 189

QUESTION. . . Does the 1940 edition of the National Electrical Code recognize the use of the twist lock type of attachment plug and receptacle?

ANSWER. . . Yes, except for the special conditions such as are stated in Sections 5107, 5109, and 5308.

Interpretation No. 190

QUESTION. . . Was it the intent of the Electrical Committee, in changing the text of sub-paragraph (e) of Section 94102, as in the 1940 edition of the National Electrical Code, to require that lampholders for fluorescent lamps be made of porcelain?

ANSWER. . . No.

Interpretation No. 191

QUESTION. . . Does paragraph (a), Section 2351 of the 1940 edition of the National Electrical Code apply in the case of theatres, including motion picture houses, as in Article 520?

ANSWER. . . Yes, as is provided in the Code arrangement, see Introduction, provided, however, that all requirements for the service for the emergency lighting system, Article 700, are satisfied.

Interpretation No. 192

QUESTION. . . What is intended by the term "fixed receptacle" in the text of paragraph (a) of Section 2011 of the 1940 edition of the National Electrical Code?

ANSWER. . . It is intended that lampholders should not be employed; in effect

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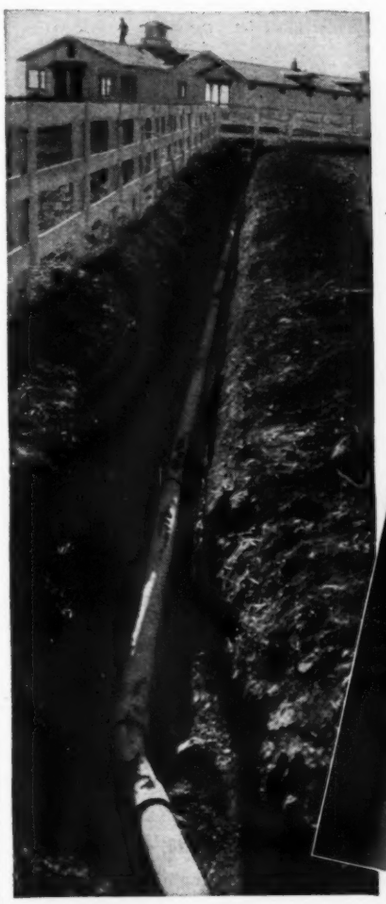


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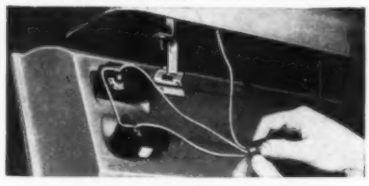
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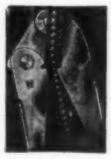
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Questions on the Code

[FROM PAGE 147]

the provisions of Section 4171 are repeated. Accordingly, the use of a pendant cord connector is not contrary to the intent.

Interpretation No. 193

QUESTION... Referring to Section 2440 of the 1940 edition of the National Electrical Code, is it the intent, when other than qualified persons are involved, that fuses or thermal cutouts cannot be touched unless the circuit has been opened by the specified disconnecting means?

ANSWER... No, the intent is to specify that the independent disconnecting means shall be provided.

Interpretation No. 194

QUESTION... Under Section 3013 of the 1940 National Electrical Code, may conductors carrying currents of both AC and DC systems be installed in the same conduit or enclosure?

ANSWER... Yes, provided the several limitations of the Section are observed.

Interpretation No. 195

QUESTION... What is the intent, with respect to "correction factor for room temperatures over 30 degrees C" (86 F) of Tables 1 and 2 of the 1940 edition of the National Electrical Code?

ANSWER... The intent is that room temperatures shall be assumed to be 30 degrees C (86 F), without respect to geographical location, for all interior wiring except in parts of premises (regardless of geographical location) which are recognized as exposed to high artificial heat such as rooms containing boilers, bake ovens, commercial kitchens, enameling ovens, grain dryers, metal heating furnaces, etc. or in industrial plants near ovens or other equipment producing high ambient temperatures.

Interpretation No. 196

STATEMENT... A single raceway contains up to nine wires of different sizes carrying, for example, armature and field currents of an elevator motor and the wires of the elevator brake. The duty is intermittent.

QUESTION... Was it the intent to apply Note 5 (Page 303) with Tables 1 and 2 of the 1940 edition of the National Electrical Code to such a combination of wires in a single raceway?

ANSWER... No, Note 5 assumes continuous loads according to the values in Table 1. Note 7 (Page 304) must be satisfied in any event.

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Interpretation No. 197

QUESTION. . . With respect to Section 4314 of the 1940 edition of the National Electrical Code, is it the intent that the values in amperes for full load ratings of motors, given in Tables 21-24 of the Code, be recognized in lieu of other values in amperes appearing on the motor nameplates?

ANSWER. . . Yes, but for certain conditions these values must be modified as provided in the footnotes of the tables.

Interpretation No. 198

QUESTION 1. . . May individual single-pole circuit breakers be used for motor branch circuit protection?

ANSWER. . . Yes, for the conductors of 2-wire ungrounded circuits and for the ungrounded conductors of 3-wire direct current and single phase circuits, as is permitted in Section 2405, provided there is elsewhere in the branch circuit a motor running protective device conforming to Section 4328 and to other requirements of the Code for motor running overcurrent protection.

QUESTION 2. . . May a combination of individual single-pole circuit breakers, with handles tied together so as to provide common manual operation, but not necessarily common trip, be used for the motor branch circuit overcurrent protection and also as the disconnecting means and/or the controller and/or the running motor protection?

ANSWER. . . Section 4328 prohibits the use of such a combination as the motor running protective device. The combination may be used for the motor branch circuit protection for the conductors of 2-wire ungrounded circuits and for the ungrounded conductors of 3-wire direct current and single phase circuits, as is permitted in Section 2405 and may also be used as the disconnecting means and/or as the controller, providing all requirements of the Code for these devices are satisfied and if separate motor overcurrent running protection is also provided.

Interpretation No. 199

QUESTION 1. . . What is included in the term "emergency within the building" in the text of Section 7011 of the 1940 edition of the National Electrical Code?

ANSWER. . . Such an emergency is created by the failure of the principal lighting system of the premises.

QUESTION 2. . . Is a single service to be accepted in all cases as the source of current supply to an emergency lighting system?

ANSWER. . . See finding, Interpretation No. 122. The authority enforcing the Code should determine from his own knowledge of conditions whether a given source of current supply affords the requisite reliability of service.

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In the News

SOUTHWESTERN INSPECTORS MEET IN SAN JOSE

The non-tamperable fuse situation was the only one over which there seemed to be any debate at the first annual meeting of the International Association of Electrical Inspectors for the current season. The Southwestern Section held the first meeting of a series of Section meetings August 25-27, in San Jose, Calif.

Eager for the non-tamperable fuse to be standardized so that the 1940 Code provisions for circuit arrangement on a square foot basis may be made effective with non-tamperable protection, the inspectors expressed disappointment that only two types will be made available under the agreement reached between the patent holders and the Electrical Committee. Claiming that inconsistency prevailed because the new Code sets up fuse protection based on wire carrying capacity, a motion was passed urging that three standard bases for non-tamperable fuses be standardized upon rather than two. Under terms of the agreement between the patentees and the Electrical Committee, two standard bases or inserts would be available, one for from 0 to 15 amp., the other for 16 to 30 amp. Contention was that fuses should be based on 15 amp. for No. 14 wire, 20 amp. for No. 12 wire and 25 amp. maximum for No. 10 wire.

The controversial wire tables were not debated. Although nothing was said on the subject, the fact that none of the California cities so far have adopted the wire tables of the 1940 Code was eloquent of a type of "passive resistance" to them, which will have to await the simplification promised in the 1943 Code for full adoption.

George Kimball, electrical engineer, Industrial Accident Commission of the state of California, and national president of IAEI, urged inspectors to volunteer their services to defense industries in the interests of continuous operation and safety.

The first of the series of conventions was addressed by a number of notables in the field, among them Arthur Abbott, author of National Electrical Code Handbook; Howard Weber, U. S. Rubber Co.; Joseph Siddall, engineer, H. H. Robertson Co.; J. C. Ingram, Bussman Mfg. Co.; J. W. Whittington, Electrical Cord Manufacturers, NEMA; and Victor H. Tousley, field engineer, NFPA, and international secretary of IAEI. Among local speakers were William P. Bear, Pacific Gas and Electric Co., who told of the utility power factor problem; Roy J. Walker, Westinghouse Company, who described small circuit breaker protection for lighting and motors; and R. E. Lagerstrom, illuminating engineer, General Electric Lamp Dept., Oakland. Otis W. Newcomb, chief electrical inspector, Long Beach, Calif., and president of the Section, presided. Clifford Prudhomme, chief electrical inspector, Sacramento, was elected president. Fresno, Calif., is the next meeting place.

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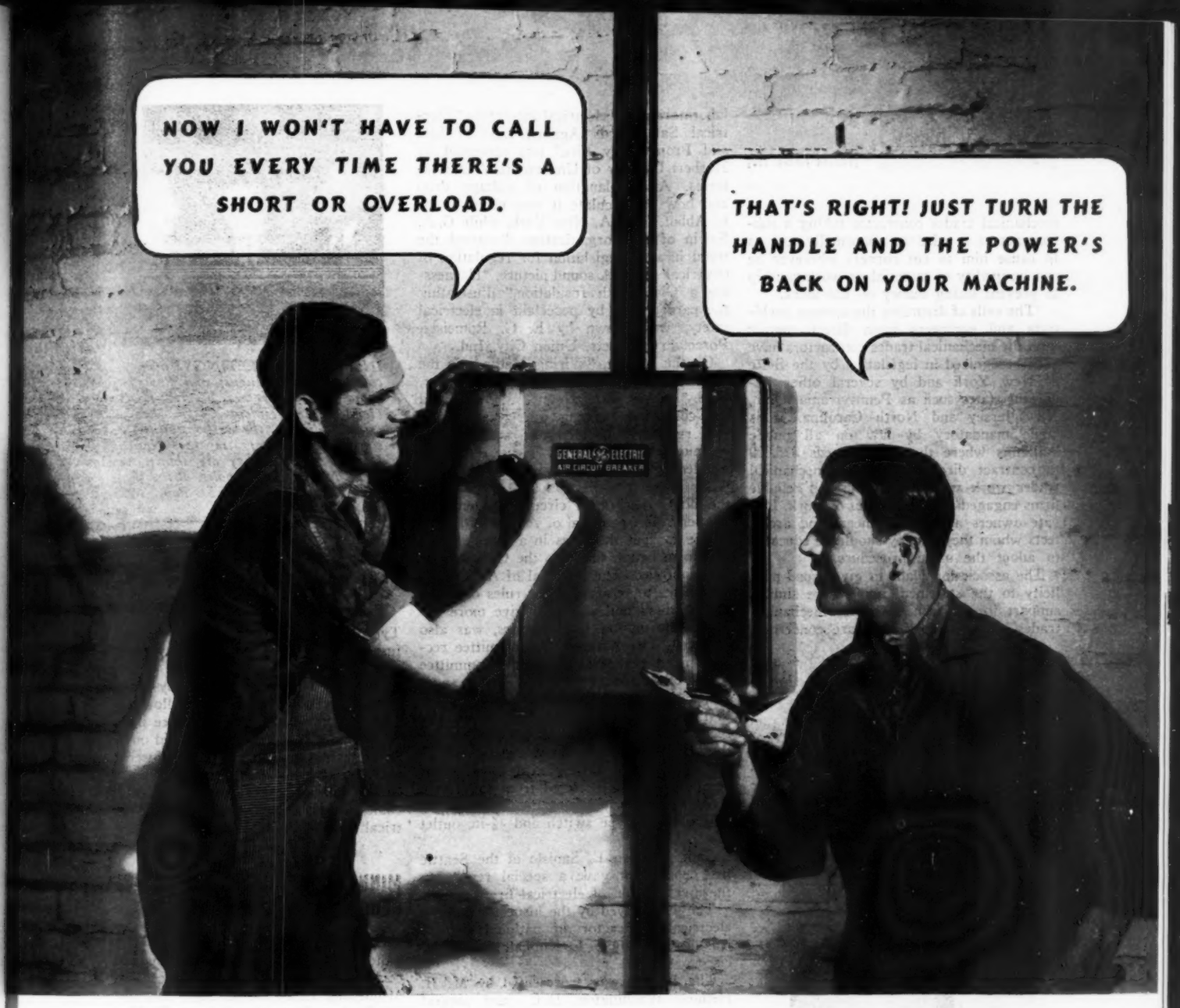
The New York State Association of Electrical Contractors and Dealers has started to support the work of NECA in Washington by promoting the function of the specialized sub-contractor in that state. By a recent resolution they set forth with commendable clarity why "owners, architects, and engineers should make direct contracts with the mechanical trade, instead of delegating to carpenter-mason contractors or those popularly known as general contractors the right to make separate sub-contracts with contracting organizations engaged in electrical, plumbing, heating, piping or air-conditioning work."

They further state that "to continue to allow the carpenter-mason or general contractors to add between 5 and 15 per cent to the cost on work which they do not and cannot do themselves, but which they call in mechanical trades contractors to do for them, is a waste of the owners' money. The 'theoretical supervision' which the carpenter-mason and general contractors claim as an excuse for charging this 5 to 15 per cent is nothing more than a pretext because they cannot supervise nor do they fully understand the technical nature of the work performed.

"Carpenter-mason and general contractors speculate at the owners' expense. They first use the lowest bid which they have received after bargaining with mechanical trades contractors. After they have obtained the contract, instead of using such low figure from a responsible and experienced mechanical trades contractor, they shop for still lower bids for the purpose of increasing their own profit on the contract which they already have. This injures the owner for the reason that such shopping for bids usually results in a



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The association plans to give broad publicity to the statement and secure similar support for it from the other mechanical trades of New York, that are concerned.

NORTHWESTERN INSPECTORS HOLD CONVENTION

The 15th annual meeting of the Northwestern Section, IAEI was held at Tacoma, Washington, Sept. 2-5. The technical program was highlighted by Article and Special Committee reports.

Robert Shepard, Underwriter's Laboratories, outlined the relations between the laboratories and electrical inspectors "Electrical Safe-guards Against Loss of Life and Property by Fire" was presented by Herbert G. Ufer of Underwriters' Laboratories. An explanation of voltage drop and how to calculate it was given by A. L. Abbot, NEMA, New York, while G. A. Sawin of that organization discussed the trend in state legislation for regulation of electrical work. A sound picture, "Harnessing a Giant with Insulation," illustrating the part played by porcelain in electrical safety, was shown by E. G. Romeiser, Porcelain Products, Union City, Ind.

On the subject, "Wiring Methods in the National Emergency," Howard H. Weber, U. S. Rubber Co., New York, analyzed the confusion existing over the present code rules on rubber covered wire.

Among major Code changes recommended by Article Committees was a proposal to rewrite Section 2121 to 2175 of the NEC on branch circuits in ten new Sections. The proposal of Article 210 committee to "put the rules in a more simplified form better suited to the Code users," was approved. The proposal of Article 450 committee to re-arrange the rules covering transformers and vaults to give more detailed information to inspectors, was also accepted. The Article 730 Committee recommended that the Electrical Committee review this article, covering outside wiring, with a view to clarifying the rules. With the exception of other minor changes recommended in Article Committee reports the 1940 edition of the Code met favor with the Section. The convention concurred with recommendations received from the North Carolina chapter opposing the continued use of the clamp type switch and ¾-in. outlet box.

Capt. Stephen E. Sanislo of the Seattle fire department gave a special report on the investigation of electrical fires.

The part played by the inspector and the electrical contractor in national defense was discussed by G. E. Kimball, San Francisco.

The IBEW was represented by M. H. Hedges, Washington, D. C., and several local members. E. S. McConnell, Edison Electric Institute, gave a brief analysis of how the contractors and inspectors benefit from the use of small diameter wires. Two code breakfasts covered priorities and substitution of materials, and the protection of industrial plant transformer installations.

Officers for the forthcoming term are, president, W. L. Gaffney, Tacoma, Wash.; first vice-president, W. R. Volheye, chief state inspector for Oregon; second vice-president, J. H. Stayner, Utah Power & Light Co.; secretary-treasurer, F. D. Weber, Oregon Insurance Rating Bureau. L. W. Going was again named to the executive council, and with Weber was re-elected as representative of the NFPA Electrical Committee. Members of the executive committee, in addition to the officers, are to be C. H. Lyness, Vancouver, Wash.; H. E. Chambliss, Montana Power Co.; R. A. Walker, Seattle; W. I. Downie, Trumbull Electric Co., Seattle. The 1942 annual meeting will be held in Portland.



CONVENTION CHIEF—J. S. Copeland, general chairman of the Houston Convention Committees, has been working like a beaver to get everything ready for the 40th Annual Convention of the National Electrical Contractors Association to be held in that city this month. An interesting program includes a post-convention tour of Mexico.



***INSPECTOR MEETINGS** over the country during August and September heard IAEI Secretary V. H. Tousley (left) and President G. E. Kimball (right) discuss the responsibilities of electrical inspectors in the National Defense effort. They are shown with F. H. Moore, Indianapolis, at the Western Section meeting in St. Paul, Minn.*

TYPE S FUSE DEAL COMPLETED

The licensing arrangement covering the Type S fuse, the so-called tamper-resisting fuse, manufactured by Bussman Manufacturing Company of St. Louis has been completed. This is announced by National Fire Protection Association, following the action of its Electrical Committee in June. All formalities were consummated on Sept. 2nd, making this plug fuse and fuseholder available to any manufacturer under license, without charge, and the fuse becomes standard under the National Electrical Code.

MINNESOTA TACKLES ALL INDUSTRY FLUORESCENT PROMOTION

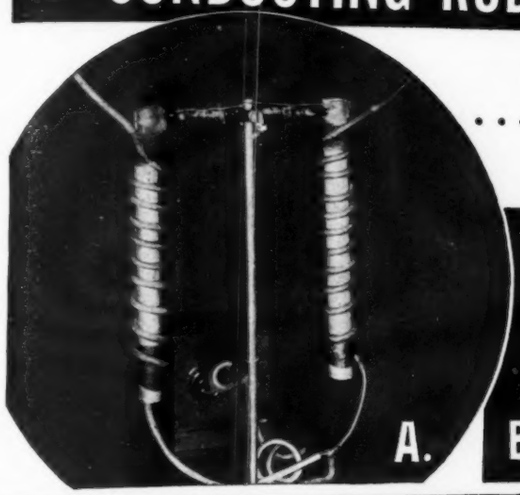
A cooperative industry program to promote high quality, high level fluorescent commercial lighting was announced at the Minnesota Electrical Council meeting in St. Paul on September 8 by A. H. Kessler of North Central Associated Electrical Industries. The program is a result of an industry attempt to check chaotic sales conditions and to stop wide-spread sales by itinerant peddlers who are cashing in on the disunity existing in legitimate electrical trade channels.

A committee consisting of representatives from each section of the electrical industry in the North Central area outlined a special program of objectives for the promotional campaign:

1. To promote new business on fluorescent and incandescent lighting in the commercial and industrial fields.
2. To assist purchasers in getting authentic information and approved plans for quality, high level lighting.
3. To establish an improved basis for confidence regarding trade practices within the industry.
4. To offset false and misleading claims for fluorescent lighting by presenting the facts.
5. To inform and educate the trade in

CONDUCTING RUBBER makes it possible...

Makes any cable insulation "Corona proof" . . . dissipates static electricity and adds to the life and safety of POWER CABLES





Look at this test...

A VOLTAGE OFF

Both cables are wrapped around mandrels. The conductor on the left is insulated with "ozone proof" rubber, but not shielded. The conductor on the right has the same type of insulation with a surface covering of CONDUCTING RUBBER—same total thickness of wall in each case.

B VOLTAGE ON

Visible corona appears at the surface of the unshielded conductor on the left. On the second conductor, American Steel & Wire Company's Type PS Semi-Conducting Shielding prevents corona formation.

Amerclad rubber-sheathed shovel cable with Type PS Semi-Conducting Shielding. Note ground wires between shielded conductors.

TYPE PS Semi-Conducting Shielding (conducting rubber), a new development by American Steel & Wire Company, solves an old and troublesome problem in the manufacture of insulated cables. By research and by experience, we have proved that Type PS Shielding completely eliminates the deteriorating effects of corona by preventing corona formation. Besides controlling "electronic ionization of air," it also:

1. Increases the life of power cables and widens the range of applications.

2. Protects against shock hazard by providing a grounded exterior.

3. Prevents electrical disturbances from being radiated from the cable or absorbed by it.

Type PS Semi-Conducting Shielding is always in intimate contact with the cable insulation proper. When used with rubber insulation, it adheres to the rubber and becomes an integral part of its surface. By preventing corona and consequent generation of ozone, Type PS Shielding permits the use of standard rubber insulating compounds for high voltage service. No longer is it necessary to employ oil-base compounds in which some degree of corona-resistance is obtained only by sacrificing such typically rubber-like qualities as tensile strength, elasticity, ability to withstand heat and to resist deformation.

Write today for our technical bulletin and other information.

AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors*

United States Steel Export Company, New York

UNITED STATES STEEL

YOU GET ALL THREE
with a
BLACKHAWK
Pipe Bender



Blackhawk Benders do MORE than bend pipe. They include a Porto-Power Hydraulic Unit that can be used separately from the bending attachments. Here is the triple utility:

1 PIPE BENDING

Smooth, remotely controlled hydraulic power bends rigid conduit and pipe up to 4" diameter. Saves need for elbows and couplings and otherwise necessary cutting and threading.

2 MAINTENANCE AND PRODUCTION

Big range of attachments adapt the hydraulic unit to push, pull, bend, press, spread and clamp work. Pull gears and pulleys, lift machinery, (as shown at left)—do scores of other jobs allied to pipe bending.



3 SPECIAL JACK

Compact 10 or 20-ton ram (same as used in pipe bending) works in all directions — and at any angle. Preferred to all other types of jacks.

MAIL COUPON TODAY

BLACKHAWK MFG. COMPANY
Dept. P20101, Milwaukee, Wis.

Send Full Information on your Pipe Benders.

Name.....

Company.....

Address.....

In the News

[FROM PAGE 152]

proper planning, selling and servicing fluorescent equipment.

6. To direct the business through qualified electrical trade channels, with emphasis on the contractor-dealer's position.

Opening gun of the campaign is a full page advertisement which will appear in Minnesota-Northwest Trade magazines reaching 40,000 business establishments. The ad asks the customer to get good engineering advice and a lighting plan, to select good fluorescent fixtures and "buy the complete installation from a reliable electrical contractor in your own city. He will give you a fair and reasonable price consistent with good workmanship—and most important, you will know where to go for service and replacement."

WESTERN INSPECTORS AND MINNESOTA CONTRACTORS MEET

Priorities, code problems and post-defense programs were discussed as 600 electrical men gathered for concurrent meetings of the Western Section IAEI and the Minnesota Electrical Council at St. Paul, Minn. on Sept. 8-10.

As a last opportunity for Section discussion of Code developments before preparation of the 1943 revisions, the inspectors devoted the greater part of the three day program to a detailed review of the National Electrical Code and reports of the Article Committees. Particular interest and discussion centered around a report of the Article Committee on "Grounding" presented by O. A. Glasow of Minneapolis and the recommendations of the Article Committee on "General Requirements for Wiring Methods" reviewed by L. P. Dendel of Lansing, Mich.

The report of the Article 250 committee, headed by C. V. Dunn of Kansas City recommended a number of changes in the rules pertaining to grounding methods including the use of the grounded circuit conductor for grounding fixed and portable equipment and the connection of the grounding conductor to the grounded circuit conductor at any point in the system. The meeting rejected the report following a protest by C. M. Park of Chicago, a member of the committee, that the provision recommended would permit the general use of bare neutral conductors.

The committee on Article 300 presented a statement of principles regarding revision in the Code rules for conductors which was received favorably by the convention.

To aid in simplifying the much discussed wire tables, L. P. Dendel recommended:

1. Simplify the tables by reverting to the 1937 capacity values for type R.
2. Improve type R insulation so that it will pass the same test procedure used in developing the 1940 tables.
3. Reduce the thickness of type R insulation only if the finished conductor will have mechanical and electrical characteristics of present type R.
4. The committee believes that it will be impossible to distinguish between continuously loaded conductors and those not continuously loaded.
5. If 60 and 75 degree grades are eliminated, slow burning conductors should be permitted where room temperatures are less than 85 degrees.
6. The committee does not believe that types SN and RU conductors should be used for anything but rewiring purposes in fire resistive buildings until such time as we have more experience on this type.



FIRST IN SOUTH BEND. William Haase receives South Bend's first certificate for an adequately wired home from Charles Colip, president of the local Bureau and of Colip Bros., Inc., local electrical contractors. Watching the ceremony are (left), John Webb, Indiana & Michigan Electric Co., secretary of the Bureau and (right) L. R. Palmer, manager of Builder's Store, electrical contractors on the job.

7. Correction factors for more than 3 conductors in a raceway may be eliminated for sizes 14, 12 and 10.

8. A new paragraph permitting conductors used for intermittent duty only to be installed without temperature correction factors.

9. Geographical location shall have no bearing on temperature correction factors.

During the meeting the inspectors heard several speakers on topics relating to electrical problems. Howard H. Weber, U. S. Rubber Co., New York, urged immediate industry action to simplify the wire line as a patriotic duty at this time of national crisis. Quoting George Andrae of NECA in a recommendation to standardize on type R from sizes 14 to 1 abandoning 10, 6, 5, and 3 and on type RH from size 0 to 500,000 omitting all sizes except 0, 000, 350,000 c.m. and 500,000 c.m., Weber asked the inspectors to consider also the all-purpose use of type RU up to No. 6.

Small diameter wires as the key to the bottleneck in rewiring existing buildings will play an important part in post-war business for the electrical industry. W. T. Stuart, Middle West Editor of *Electrical Contracting* told the convention, "—as the economic machinery of this industry tackles rewiring with all the new vigor and courage that the defense effort has revived." "Future adequacy depends on raceway capacity," J. J. Siddall, H. H. Robertson Co., Pittsburgh said in outlining the use of cellular metal floors as structural flooring and electrical raceways. L. E. Johnson, Northern States Power Co., Minneapolis, gave a dramatic display of fluorescent lighting application.

The progress in Adequate Wiring for homes was outlined by Wm. A. Ritt, Minnesota Electrical Council, Minneapolis, describing the statewide activity in Minnesota and the cooperation of electrical inspectors in the program. Geo. A. Sawin, NEMA, New York discussed State electrical legislation activities.

At the concurrent sessions of the Minnesota Electrical Council, 200 Minnesota contractors and guests discussed the effects of priorities on the electrical contractor. Geo. W. Plank, business manager of the Minneapolis Electrical Contractors Association outlined the steps necessary to get priority ratings on projects vital to national defense. An extended discussion followed in which several contractors expressed concern over the already critical shortage in some materials.

With increased demands for skilled labor and growing material shortage, the electrical contractor carries greater responsibility in serving vital needs of civilian industry, institutions and agriculture, as well as defense facilities, Wm. A. Ritt, secretary of the Council told the contractors. More than ever before we must help our country by helping ourselves, he said. The new installment credit regulations for the contractors who handle appliances, new trends in wiring methods and fluorescent lighting applications were also discussed at the contractor's meeting.

The Western Section, IAEI, chose D. J. Talbot, of Chicago as president, V. C. Moulton, Denver first vice-president; G. W. Howse, Hamilton, second vice-president and F. H. Moore, Indianapolis, secretary-treasurer.

NISA STATES ITS CASE

Following its meeting with OPM officials in Washington in the effort to secure a blanket rating for the supplies of motor repair shops, NISA has made a statement of facts covering their material needs. It is striking in the smallness of the net consumption of new copper over scrap returned to the nation's reserves, considering the large volume of power equipment that is involved. The following facts are now cited to the Government:—

"1. There is estimated to be about 5,400,000 integral horsepower motors in operation throughout the country.

"2. The repair and maintenance of such equipment requires highly and specially skilled workers, much more skilled than the workers in the factory where the new electric power equipment is manufactured.

"3. It is a relatively small industry in volume and divided into many small shops. There are about 2,000 of such shops in the United States, the largest one having about 75 employees on this work.

"4. Despite the importance of this industry in maintaining production, the amount of material required by it in repairing and maintaining electric power equipment is insignificant. In the case of the most important single material—copper magnet wire—required, the old copper wire is stripped from the equipment and thus almost the same amount is returned to the copper stock of the country as scrap copper. The total amount of copper in the form of new wire required by the industry for this work is estimated to be only 1,000 tons per month gross, at least 90 percent of which basic material copper is returned to the copper stock piles.

"5. By repairing and maintaining existing electric power equipment in operation, the demand, on the already overcrowded facilities of the electric equipment manufacturers for new equipment, is reduced by just that much. Yet despite the above facts, the Electric Service Shops throughout the country are faced with shutdowns by the failure to provide a priorities plan whereby the service shops can be assured of receiving the insignificant, but absolutely necessary, amount of material for such work.

"6. To illustrate, we cite the report of a member of the industry that he was unable to obtain copper wire from the Anaconda Copper Company even though the wire was to be used to repair a motor in Anaconda's own plant.

"7. In the emergency work in which we in the Service Industry are engaged it is extremely difficult to segregate defense and non-defense activities. Often during the time when we would be investigating and trying to obtain and pass along priorities, the repair or service job could be completed many times.

"Is it essential to maintain in operation an elevator, a pump or a blower, in an office building wherein may be located offices, drafting rooms, etc. of firms expediting defense work? It is hardly feasible when an elevator service call is received on a shutdown elevator, which is perhaps stuck between floors, to conduct an investigation. Also, what is the status of elevator and electrical equipment in hospitals, institutions, state and local government buildings?"

NISA is therefore asking for a general clearance for the materials that the motor shops require to keep electric power equipment running wherever it is in use.

DOLPH'S Synthite Insulating Varnish Protects Transformer Coils in Full Voltage Short Circuit Tests

Buffalo, New York — DOLPH'S SYNTHITE Insulating Varnish was used to impregnate all the coils of fourteen 500 KVA transformers manufactured by the Erie Electric Company, Inc., of this city for service at the Panama Canal. Upon completion of construction, the transformers withstood impulse tests on all terminals and short circuit tests at full voltage for three seconds with twenty times full load current flowing. This short circuit test imposes an enormous strain on coil insulation and the proven ability of SYNTHITE Insulating Varnish to stand up under such conditions should prove of great interest not only to manufacturers but to repairers of electrical equipment.

DOLPH'S No. 22 Black Coil Bonding Varnish Used On Cotton, Asbestos and Fiberglas Tape

Pittsburgh, Pennsylvania — A large coil manufacturer uses DOLPH'S No. 22 Black Coil Bonding Varnish for brush application on cotton, asbestos and Fiberglas tape used in the formation of large sizes of railway armatures and field coils. Before each tape serving is applied, the coil surface is given a brush application of No. 22 Black Coil Bonding Varnish which serves to adhere and fill the porous tape coverings. This varnish also fills in voids usually encountered at points where tapes cross over and also fills spaces at the ends of current conductors. The completely assembled coils are then treated with DOLPH'S CHINALAK No. 7 Black Baking Varnish and given a glossy finish coat of No. 55-P Red Insulator by brush or spray application.

DOLPH'S Synthite Insulating Varnish Recommended for Use on Formex, Formvar and Nylon Coated Magnet Wire

The DOLPH Laboratories have received many inquiries for information on varnishes suitable for treatment of coils formed from Formex, Formvar and Nylon coated magnet wire. Not all insulating varnishes are suited for this work but several DOLPH SYNTHITE Varnishes have been recommended by the DOLPH Laboratories as possessing characteristics which fit them for this application. Among them is SYNTHITE No. 153, a varnish finding favor for this use because of its high bonding strength, heat endurance and excellent oil, water and alkali resistance. SYNTHITE No. 153 may be obtained in a cherry red (R) or yellow (Y) color thus contributing greatly to the eye appeal of the finished product. Coils treated with SYNTHITE No. 153 may be given a final finish coat of DOLPH'S No. 55-P Red Insulator to provide a high gloss, elastic film protection against the action of oil, moisture, dirt and corrosive vapors.

Further information regarding any products described above may be obtained by writing to the JOHN C. DOLPH COMPANY, 168 Emmett Street, Newark, New Jersey.



NEW CUSTOMERS

for Private Phone systems will be found in all Industries today. Quick communication spells increased efficiency, speed-up of routine and better production.

Sell the Couch line which offers a telephone system for practically any plant.

Write today for catalog with full information on a wide range of telephone systems.

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S. H. COUCH COMPANY, INC.
NORTH QUINCY, MASS.
Sales Offices in Principal Cities
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Manufacturers of Telephone, Code Call and other Communication Equipment

In the News

[FROM PAGE 155]

COMING MEETINGS

National Electrical Contractors Association—Annual Convention, Rice Hotel, Houston, Texas, Oct. 6-8.

National Electrical Wholesalers Assn.—Semi-Annual Convention, Hotel Statler, Detroit, Mich., Oct. 14-17.

National Electrical Manufacturers Association—Annual Meeting, Waldorf-Astoria Hotel, New York, N. Y., Oct. 27-31.

International Association of Electrical Leagues—Annual Conference, Hotel Raleigh, Washington, D. C., Nov. 13-14.

BUILDING MOVEMENT WILL AID CONTRACTORS

An encouraging announcement to the electrical contracting industry has recently come from the New York Board of Trade. The Board, through its Construction and Allied Industries Section, is sponsoring an industry-wide program for better building to promote better understanding and higher standards within the construction industry.

The program calls for special aid to the electrical contractors and manufacturers and suppliers of electrical equipment and devices and includes the following phases of action:

1. To assist in promotion of more adequate wiring.
2. To reduce the bid shopping evils.
3. To curtail and eliminate unauthorized substitutions of materials and equipment.
4. To reduce cost-hiking labor disputes and job-stalling.
5. To ease materials priority strangulation of electrical contractors and construction in general.
6. To promote a payroll-loan plan from banks.
7. To promote quality workmanship and the use of high grade materials and equipment.

This ambitious program has as its objective the elimination of jerry-builders, dishonest finance and the use of substitute and substandard material from and in building construction. It will involve representatives of architecture, engineers, credits, distributors, general contractors, sub-contractors, insurance, labor, manufacturers, real estate, the general public, financial institutions and branches and sub-divisions of each. It is a plan which, for the nominal price of cooperation, will help the construction industry help itself.

NORTHERN CALIFORNIA CONTRACTORS MEET

Two Congressmen from the district and W. J. Varley, representative of the Electrical Contractors' Assn. of Northern California just returned from Washington, told the special meeting of the Electrical Contractors' Assn. of Northern California, held after a joint meeting with the Electrical Inspectors at San Jose, August 26, of changes in national policy which will permit subcontractors to do electrical work on defense projects. Also described were

Monarch
Your Best Choice for-

RENEWABLE FUSES
"MON-O-LAG"

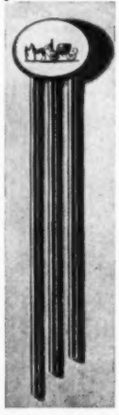


• • •
RUGGED CONSTRUCTION
EASIER TO RENEW
MAXIMUM PROTECTION
• • •
Completely approved



"THE MONARCH LINE SINCE 1909"
Monarch
FUSE COMPANY, Inc.
JAMESTOWN, NEW YORK

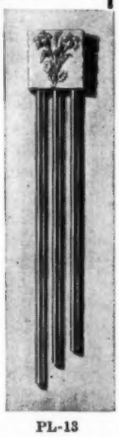
LIBERTY LEADS . . .
. . . THE NEW PLAQUE LINE



Model PL-2 and PL-3 — Supplied with 16 volt 2 coil mechanism and transformer. Mounting space, Carriage Design — 42" long by 9½" wide.

Sell them for their beauty .. install them for service!

Model PL-12 and PL-13 — Supplied with 10 volt mechanism less transformer. Operates through 400 feet of annunciator wire. Mounting space — 46" long x 7⅛" wide for Floral Design.



PL-13

Here are chimes to fit the times . . . new, beautiful wall decorations, easy to sell, a pleasure to install.

Porcelain covers, with hand painted colors fired in, add distinction and sales appeal. Quality mechanism, plus pleasantly toned chime tubes, add to its value. *Sell them for beauty, install them for service.* Write us for details on all types of LIBERTY chimes . . . prices, discounts, etc. Also other LIBERTY products . . . doorbells, buzzers and other signalling devices.

It's Liberty Since the Beginning of Chimes!
The LIBERTY BELL MFG. Company
MINERVA - - OHIO

the new agreements between A.F. of L. unions and the government pertaining to time and a half for overtime, shift work and employment of subcontractors.

Roy W. Butcher, San Jose electrical contractor and chairman, Contractors' License Board, told of legislation passed in California to strengthen the law.

PRIORITY RATINGS FOR DEFENSE HOMES

A detailed project priority rating plan for privately-financed real estate developers who will build low cost homes for rent or sale in defense areas has been put into effect by OPM. The ratings will be provided to insure materials for building up to 200,000 homes throughout the country—in addition to 100,000 defense housing units being built with Government funds.

The ratings are applicable only in specified defense areas and only to materials on OPM's Defense Housing Critical List, which includes electrical wiring supplies of specified types. Copies of both lists are available from Defense Housing Coordinator Charles F. Palmer in Washington.

Electrical supplies to which these project ratings may be applied include:

Underground and overhead materials; main service switch, meter pan or receptacle, meter, circuit breaker or fuse type distribution panels, conduit fittings, outlet boxes and wiring devices (limited), plates, switches and convenience outlets.

Aluminum and solid brass or bronze lighting fixtures are barred, but copper and brass plating is permissible. Indoor fixtures must be light gauge spinnings, stampings or drawings. non-metallic wherever practical; outdoor fixtures must be cast and wrought ferrous metals.

For non-fireproof construction interior wiring materials permitted are knob and tube, wire and fittings, wire and non-metallic sheathed cable, flexible metal conduit and armored cable (limited zinc coating). For fireproof buildings, permitted materials are wire, rigid steel conduit (enameled), flexible metallic conduit and armored cable.

Permitted electrical accessories include wiring, bells, buzzers, push buttons and transformers, lock releases and entrance door communication for multi-family dwellings. Household equipment includes ranges and refrigerators as available in the industry. Oil, gas or coal furnaces may be used, except in the East where oil is banned.

Developers also may apply their priority rating to overhead and underground materials of metal or with metallic components for extensions from utility distribution systems.

MILLIONS ADDED FOR DEFENSE HOUSING

A bill recently signed by the President increases by $200,000,000 the FHA's authorization to insure loans financing privately-built defense housing in designated areas where shortages are threatening to impede the defense production program.

The new appropriation will assure financing facilities for the construction of approximately 60,000 additional dwelling units under Title VI of the National Housing Act.

Mortgages insured under Title VI are limited to a maximum of $4,000 on a single-family dwelling, $6,000 on a two-family unit, $8,000 on a three-family house and $10,500 on a four-family structure. FHA operations under Title VI are distinguished from normal operations under Title II in that builders are enabled to obtain mortgage loans up to 90 percent of the valuation of homes which they build for sale or rent, whereas normally only owner-occupants of new homes financed with FHA insured mortgages could obtain this much.

Through August 30, construction had already started on 12,273 new homes under Title VI and this total is being increased by almost 1,000 new homes per week. Under the regular phases of FHA between 4,000 and 5,000 additional small homes per week have been started and since January 1 construction on 147,349 new small homes has been started.

ALTERNATE FEDERAL SPECIFICATIONS

The following is a list of Emergency Alternate Federal Specifications that are of interest to the contractor and plant electrical men, doing this type of work:

E-J-C-71 Cable, cord and armored.

E-W-B-616 Boxes and Outlet Fittings, floor; conduit and tubing.

E-W-F-406 Fittings, cable and conduit.

E-W-O-806 Outlet Bodies; iron, cadmium or zinc coated.

E-W-O-821a Outlet Boxes; steel, cadmium or zinc coated.

E-W-P-131 Panelboards with automatic circuit breakers.

E-W-P-146 Panelboards with fuse connections or switches.

E-W-R-36 Raceways and Fittings; metallic, underfloor.

E-W-W-T-806a Tubing, electrical metallic.

E-W-W-C-581a Conduit, steel, rigid, zinc coated.



CLEAR SAILING and a swell time was enjoyed by more than 750 members and friends of the New York Chapter, IAEI on its annual moonlight sail up the Hudson River. The boys with the smiles are L. to R: Bob Rockford, Gus Steinhardt, Art Scala, Lou Truckenbrodt, Fred King and Martin Cody, officers and members of the New York Chapter and its entertainment committee.

MORE MILLIONS FOR R.E.A.

The Rural Electrification Administration allotted a total of $1,195,000 to eighteen borrowers in 14 states. All of these borrowers, cooperatives formed for rural electrification, have received earlier loans and will use these present allotments to expand or complete their systems.

Since its creation in 1935, R.E.A. has granted loans totalling $388,827,121.22.

WITH THE Manufacturers

G. E Changes

W. M. Ballenger has been appointed assistant district engineer of the General Electric Company's central district.

Harry E. Huff, for many years assistant manager of the Lamp Department's Empire Division at Buffalo, N. Y., has been advanced to manager of that division. E. F. Strong, formerly manager of this division has resigned but will continue in an advisory capacity.

•

K. D. White Heads Walker Electric

Friends of Ralph Walker, who died in Atlanta, July 30th, will be interested in an announcement by his life long associate and partner, K. D. White, as to the continuance of the Walker Electrical Company. Mr. White took over the management of the contracting division of the company some time ago, when it was renamed the White Electrical Construction Company. He now becomes president and treasurer of the Walker Electrical Company. T. J. Fleischer will continue as vice-president in charge of sales.

•

Pittsburgh Reflector Company announces the appointment of Charles H. Goddard, general sales manager for the past year, as vice-president and director of sales. Mr. Goddard has moved his headquarters from New York City to the general office at Pittsburgh.

•

Harry C. Brown has resigned from the General Electric Company as sales representative in the appliance department, in the upstate New York territory. to open an office as manufacturers' representative, His headquarters will be at 2009 Holland Avenue, Utica, N. Y.

•

Graybar Electric Company has appointed A. G. Faul as credit manager of its Cincinnati office. He replaces I. B. Stafford, who died recently.

EQUIPMENT News

Ground Connector

Type GH ground connector is a non-corrosive ground clamp for driven rod or pipe. It can be slipped over top of rod as a one-piece assembly, or from the side when the head of the pipe or rod has been mushroomed from driving. It is available in ½-in. to 1-in. sizes for rod and from ¼-in. IPS to ¾-in. IPS sizes for pipe. Burndy Engineering Co., Inc., 459 East 133d Street, New York, N. Y.



BURNDY GROUND CONNECTOR

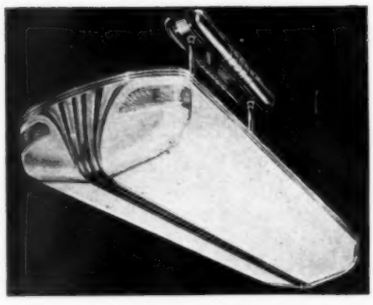
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Spot Welder

Known as the SW 150 Weld-O-Trol, this unit, for spot welding applications, is rated equivalent to a size 2-W mechanical contactor at 220 or 440 volts, 50/60 cycles. Welding current is handled at high rate of interruption by two heavy duty water cooled ignitron tubes. Tubes are held by water cooled clamps. A thermostat mounted on cooling clamps protects tubes against high temperatures caused by failure in water supply. All auxiliary control is mounted inside steel cabinet door to permit accessibility. Unit is adapted for use with heat control and either synchronous or non-synchronous weld timers including sequencing equipment. Westinghouse Electric and Manufacturing Co., East Pittsburgh, Pa.



WESTINGHOUSE WELD-O-TROL

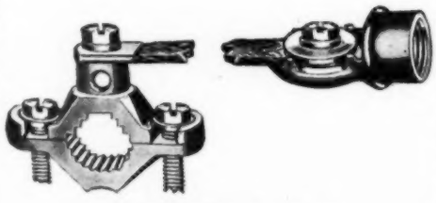


DAY-BRITE DAY-LUME FIXTURE

Fluorescent Fixture

The "Day-Lume" fluorescent lighting fixture is made of plastic and designed for direct ceiling mounting. It is also available with 27-inch hangers. The various lengths range from 53¼-in. to 125¼-in. The fixture body is hinged to ceiling plate and is easily opened for servicing. They are available for four and eight 48-in. 40-watt lamps. Fixtures are furnished wired or unwired and include sockets, high power-factor ballasts and lamp starters. They are for 110-125 volt a.c. Can also be furnished for 208 or 220 volt operation. Day-Brite Lighting, Inc., 5405 Bulwer Avenue, St. Louis, Mo.

■



SHERMAN GROUND FITTING

Ground Fitting

This solderless flexible fitting, GF-22, is for rigid conduit. It has No. 4 B & S ga. extra flexible copper braided strap between conduit end and pipe clamp. It is recommended for tight places. The pipe clamp can be detached and used separately. It is available in ½-in., ¾-in. and 1-in. sizes. H. B. Sherman Manufacturing Co., Battle Creek, Mich.



G-E PLASTIC OUTLETS

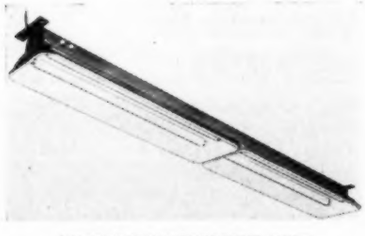
Outlets

New high- and low-tension outlets, totally encased in Tenite for Fiberduct underfloor raceway systems, have been developed. These replace some of the former brass outlets used with Fiberduct. It is claimed that the non-metallic surface of outlets makes them an ideal accessory with Fiberduct, especially when a fully insulated system is required. They are neutral in color and finish is permanent. Use of flanges between outlets and floor is not required. General Electric Co., Bridgeport, Conn.

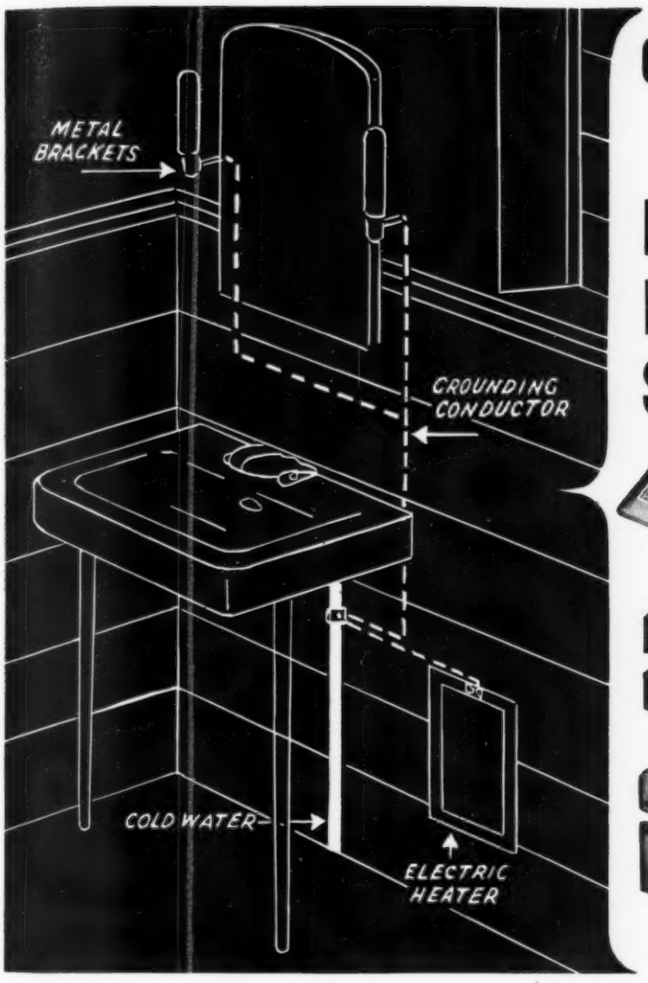
■

Fluorescent Unit

A new line of continuous row Miralume fluorescent lighting units has been designed for industrial installations. Units are designated F-104, F-208, F-154 and F-308 and may be joined end to end with like units or with one another to form a continuous wireway enclosure. Also supplied with end caps for individual mounting, and connecting band for continuous row assembly. Reflectors are attached to top housing and starters are located in top housing where they are accessible without removing lamps. F-104 is a 100-watt unit, with two 40-watt T-12 fluorescent lamps. F-208 consists of two F-104 reflectors joined end to end on a single channel housing. F-154 is a 150-watt unit, complete with three 40-watt T-12 lamps. F-308 consists of two F-154 reflectors joined end to end on a single channel housing. Units available for 110-125 volts, 60 cycle a.c. Can also be supplied in 50 cycle a.c. Hygrade Sylvania Corporation, Ipswich, Mass.



HYGRADE FLUORESCENT UNIT



Grounding Appliances and Fixtures in MODERN PORCELAIN PROTECTED WIRING SYSTEMS . . . . .



★

Porcelain Protected Wiring Systems Inherently Guard Against Shock Hazards. Exposed Metal Fixtures or Appliances Effectively Grounded.

★

On Porcelain Protected Wiring Systems, all devices and fixtures in bathrooms, laundries, kitchens, and similar areas, may be of porcelain or houses within porcelain enclosures, effectively eliminating shock hazards and assuring the highest degree of Safety. It is generally recommended that porcelain protection be provided on all exposed parts of the electrical system within reach in such areas.

In areas where metal enclosed fixtures or appliances must be used adjacent to plumbing fixtures, it is often desirable to ground the metal canopy or enclosure to prevent a shock hazard in case of insulation failure within the fixture or appliance. When such metal enclosed fixtures or appliances are installed, however, porcelain protected wiring systems offer a grounding method, independent of the current carrying conductors, which provide complete protection.

To ground metal enclosed fixtures or appliances on porcelain protected wiring systems, a separate grounding conductor, not less than number 14 wire, is extended from the system ground directly to the outlets where ground connection is desired. The conductor, preferably marked with a green braid, need not follow the wiring system and need not be installed on insulators.

BULLETIN

Defense Production aided through Electrical Industry's use of All-Porcelain Boxes. Action releases vital metals for defense needs.

The grounding conductor terminates in the outlet box in the same manner as the current carrying conductors and is connected securely to the metal enclosure of the fixture or appliance. It is recommended that joints in the grounding conductor be made only in outlet boxes.

For a residence where grounding is desired, the total ground wire required is approximately fifty feet of number 14. For example, this usually will provide for grounding. (1) a three point receptacle for the washing machine in the laundry, (2) fluorescent bracket over the sink in the kitchen and (3) a pair of cabinet brackets and built-in heater in the bathroom.

In some communities, a ground return to the system ground clamp is not required but ground connections for fixture canopy grounding may be made to the nearest water piping installation, usually the adjoining plumbing pipes. Check this with your local electrical inspection department.

Modern Porcelain Protected Wiring Systems offer the safest inherent shock hazard protection. In bathrooms, kitchens and basements, use porcelain protected fixtures and devices. Grounding where needed in a Modern Procelain Protected Wiring System is a carefully installed electrical circuit designed and used only to provide a zero potential difference between exposed metal surfaces associated with the electrical systems and adjoining grounded equipment.

Electric porcelain materials for Modern Porcelain Protected Wiring Systems are manufactured by

Illinois Electric Porcelain Company, Macomb, Ill.
Knox Porcelain Corporation, Knoxville, Tenn.
Porcelain Products, Incorporated, Findlay, Ohio

and may be obtained through your electrical wholesaler.

●

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ASK YOUR SUPPLIER

Foreign Distributor:

International Standard Electric Corp., New York

Mathias KLEIN & Sons

3200 Belmont Avenue, Chicago, Illinois

EQUIPMENT NEWS

[FROM PAGE 158]

Floodlight

This new anti-sabotage floodlight is for use at guard fences around munitions plants and other industrial areas. The dust-tight and weather-tight unit contains aluminum reflector and fresnel lens to produce an intense beam covering approximately 10 degrees vertically and 180 degrees horizontally. It is available for 300 watt standard clear lamps or for series operation with street lighting lamps. Focusing mechanism is externally operated. Revere Electric Mfg. Company, 2949 N. Paulina St., Chicago, Ill.

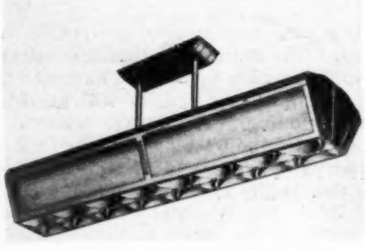


REVERE FLOODLIGHT

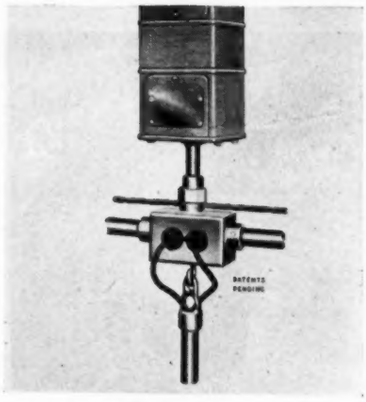
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Fluorescent Fixture

This shielded type fluorescent fixture, Model 2031, is for store, office and general commercial use. Some of the advantages claimed are low surface brightness, higher efficiency light transmission, and louvered downlight. It uses four 40-watt 48-in. fluorescent bulbs. It is corrected for high power factor and stroboscopic effect. Unit comes with canopies, for suspension mounting, but is also available for surface mounting. Length is 48½-in., width, 12-in. depth 7¾-in. It operates on 110 to 125 volts, 60 cycle a.c. Mitchell Manufacturing Co., 2525 Clybourn Avenue, Chicago, Ill.



MITCHELL FLUORESCENT FIXTURE



PYLE-NATIONAL FIXTURE HANGER

Fixture Hanger

A new fixture hanger Pylet designed for installation of combination mercury vapor and incandescent lamp fixtures. The "U" Series provides for permanent mounting of transformer required for mercury vapor lamp above messenger or span wire. Weight of transformer is carried by support rod attached to ceiling structure of building. Space is provided for two pairs of No. 10 wire. Pylet body will take single or two gang receptacle providing for attachment plug connections to mercury vapor and incandescent lamp circuits. "U" Series are available in two sizes, with ¾- or 1-in. conduit hubs. The Pyle-National Company, 1334 North Kostner Avenue, Chicago, Ill.

■

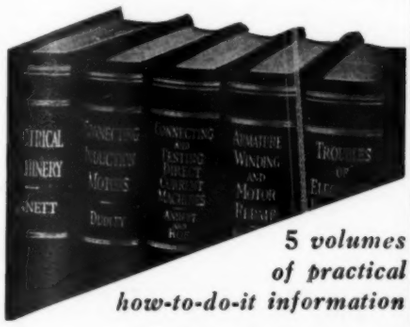


COMBINATION PERMAFLECTORS AND HOLDER

Fluorescent Lighting Unit

Permaflector No. T-11 Series is a new trough-type silver mirrored glass reflector designed to control light flux from fluorescent lamps. It claims to provide new higher intensities at normal mounting heights. Higher mounting heights are now practicable. Dimensions are 3 7/16-in. deep, 8-in. wide and 11-in. long. It requires two Permaflector No. T-11 for 24-inch, 20-watt F lamp; 36-inch, 30-watt requires three and 48-inch, 40-watt requires four. Permaflectors and "T" type holders are shipped separately and must be assembled on the job. "T" holders consist of two metal grooved strips which support trough reflectors end-to-end, to form a single reflector unit, and two metal hanger straps. Pittsburgh Reflector Company, Oliver Building, Pittsburgh, Pa.

Every phase of electrical maintenance and repair work covered in this Library



5 volumes of practical how-to-do-it information

Every man concerned with the care and repair of electrical machinery should have these practical books, with their helpful tables, diagrams, data, methods and kinks. Every one of the five volumes is jammed to the covers with sound, how-to-do-it information—the kind you have to have when anything goes wrong. Liberal use has been made of practical data and practice in repair shops so as to combine the good features of a library of methods with handbook information covering these methods.

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These books show you how to

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—know just what is wrong with an electrical machine and take charge of installation and maintenance work;
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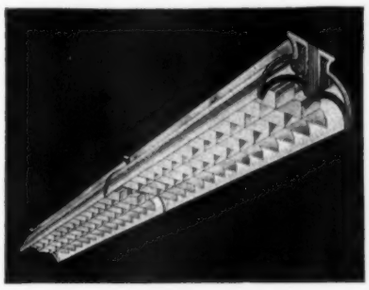
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Fluorescent Fixture

This new fluorescent lighting fixture is called the Futurliter. Base or extension sections allow units or rows to be added to initial installations. Unit uses two or three 40-watt fluorescent lamps. Available with eggcrate louvres or open bottom. May be ceiling or suspension mounted and installed individually or in continuous rows. A third row of lamps can be added to original two 40-watt units by inserting new ballast and lampholders. Edwin F. Guth Company, 2615 Washington Blvd., St. Louis, Mo.

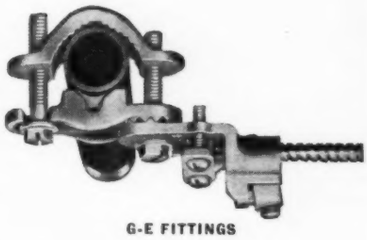


GUTH FUTURLITER

■

Fittings

A new line of pressure connector ground fittings has been developed for use with conduit wiring, armored wire and unarmored wires. Teeth on the connector hubs and on water pipe clamps of these fittings permit ground conductors to meet water pipes at any angle. Clamps have reinforcing ribs. It is claimed that the pressure grip makes a firm and secure contact. Fittings are made of malleable iron and galvanized to resist corrosion. Each fitting is marked with its size range. General Electric Company, Bridgeport, Conn.



G-E FITTINGS

■

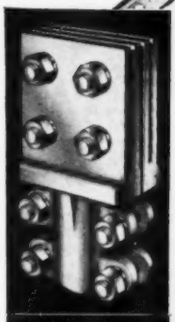
Tachometer

This new alternating current tachometer is for use in measuring revolutions per minute, feet per hour, gallons per minute in any manufacturing plant where rotating equipment is used. It is known as Type A-80 and consists of a.c. generator and voltmeter of rectifier type. Generator is the permanent magnet, a.c. inductor type. Rotating element consists of laminated iron keyed to steel shaft. Tachometer is recommended for operation over a range of from zero to 5000 r.p.m. Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

The MOST COMPLETE LINE OF Conductor Fittings

FLEXIBLE BRAID connections, any rating, single or multiple.

You need a Penn-Union Catalog, to have an idea of the immense variety of connectors we make. Practically every good type—*in a complete range of sizes.*



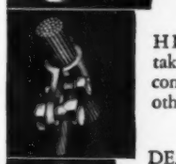
STUD CONNECTORS for single or multiple flat bus, to tubing or cable.



BUS SUPPORTS of many types, standard and special — for tubing, bar or cable. Bus bar clamps, spacers.



CLAMP TYPE elbows, straight connectors and reducers, tees, cross connectors, terminals.



HINGED E-Z TEE takes a wide range of conductor sizes. Many other types of tees.



DEAD-END CLAMPS and complete line of U-clips, nuts and washers.

Also Terminal Lugs, Service Connectors, Cable Taps, etc. See Catalog.

Every fitting is Dependable, mechanically and electrically. That's why so many of the largest users have standardized on PENN-UNION.

Sold by Leading Jobbers

PENN-UNION ELECTRIC CORPORATION
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PENN-UNION
Conductor Fittings

PAINE ANCHORS GIVE WOODSCREWS A BITE



Fig. 950

IN ***CONCRETE, TILE, STONE, MARBLE Also OTHER HARD AND SOFT MATERIALS***

EVERY TURN OF THE SCREW MULTIPLIES PAINE ANCHOR HOLDING POWER

You'll find daily use for these easy-to-install PAINE ANCHORS that hold indefinitely and pay for themselves in savings on time alone. You simply slip either type into hole drilled in material and woodscrew will cut its own deep thread in the anchor which expands to grip hole wall firmly as screw is tightened.



Fig. 955

• Fig. 950—LEAD WOODSCREW ANCHOR comes in 15 different sizes from ⅛" diam. by ½ length to ⅜" diam. by 2 lengths.

• Fig. 955—FIBER WOODSCREW ANCHOR comes in 11 different diameters in Braided and Standard Types to fit woodscrews No. 5 to ⅝" lag in popular lengths.



PAINE "SUDDEN DEPTH" DRILL BITS

Revolutionize drilling in Concrete, Stone, Brick, Tile, Slate, Mosaic, Marble, etc. Cut drilling time 50 to 75%. Use in any portable electric drill (slow speed) or brace.

Ask your Supplier TODAY for these PAINE products and write for complete catalog of PAINE Anchoring Devices.

PAINE — BUILDERS SPECIALTIES

THE PAINE CO.

2961 CARROLL AVE., CHICAGO, ILL.

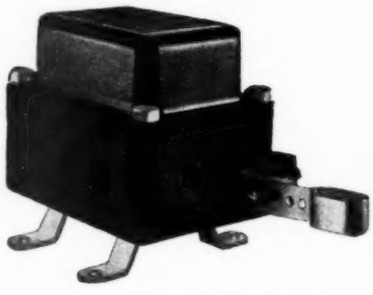
New York Warehouse & Sales: 48 Warren St.

EQUIPMENT News

[FROM PAGE 161]

Float Switch

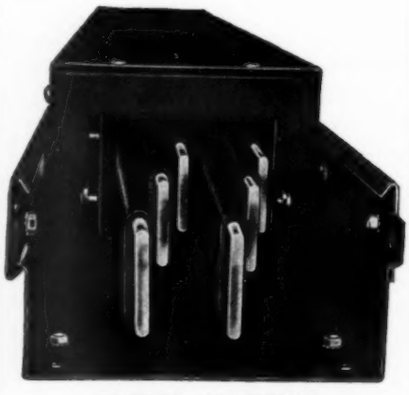
A new line of explosion-resisting and water-tight float switches has been developed. Type 9048AW is a water-tight switch. Enclosure is cast iron cover and base. A rubber gasket is provided to make it water-tight. Explosion-resisting float switch is identical to the 9048AW only the surfaces between cast iron cover and base are machined to comply with Class 1 Group D hazardous location requirements. Entries to switch chamber are through approved openings by means of closely fitted steel shafts. Rating is 110 to 500 volts a.c. or d.c. Square D Company, 6060 Rivard St., Detroit, Mich.



SQUARE D WATER-TIGHT SWITCH

Bus Duct

This bus duct is called L.V.D. (low voltage drop) Buss-Wa. Mechanical strength and bracing of conductors is amply heavy to prevent failure under mechanical stress due to short circuit condition, which may occur with general use of low impedance and high capacity transformers. It is claimed that advantages in design and performance speed production, conserve power, save time and cost. The Trumbull Electric Mfg. Co., Plainville, Conn.



TRUMBULL L.V.D. BUSS-WA



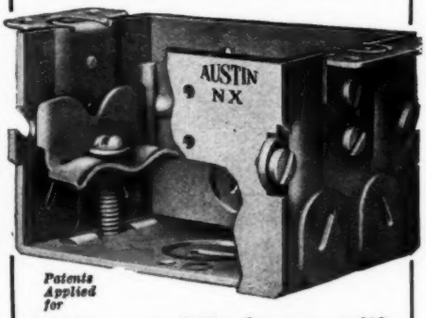
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● It's FREE—this combined manual and catalog on motor capacitors. Just the practical data you need in servicing capacitor-start refrigerators—diagrams, charts, formulae, PLUS complete handy listings of all standard capacitor-start motors and their capacitor requirements. Handy cross-index of Aerovox capacitors and motor manufacturers' parts numbers. ● Just ask us—or your local jobber—for your copy.

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IN CANADA: AEROVOX CANADA Limited

NEW AUSTIN "NX" SWITCH BOX



Patents Applied for

Made especially for use with Non-Metallic Sheathed Cable

1—Floating clamp is held clear of Pri Out for easy insertion of cable.
2—An entirely new mounting ear permitting 1⅛" adjustment.
3—The unique shaped Pri Out takes all sizes of cable up to and including two and three conductor No. 10. No rough edge to injure the braid.
4—Indenture in clamp and bottom of box holds cable rigidly and permanently in place.
5—Knockouts in bottom for fixture stud or bar hanger.
6—Plenty of wiring room.
7—By removing sides boxes can be built into any number of gangs.
8—Can be furnished with bracket for new work.

WRITE FOR FREE SAMPLE

The M. B. Austin Company

110 S. Desplaines St. Chicago, Ill.

Time Switch

The Inter-Matic time switch, TS-41, is designed for single cycle operations such as controlling signs, store window lighting, flood lighting, apartment or hotel lobby lights, yard night lights, porch lights. Switch is single pole, single throw, 35 amperes at 115 and 230 volts. Specifications include timing motor, time dial, timing range, manual control, automatic reset, terminal block, knockouts, and case. Case is 7¾-in. high, 5-in. wide, 3-in. deep. For use on alternating current. International Register Company, 15 South Throop Street, Chicago, Ill.

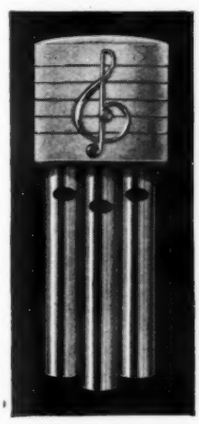


INTERNATIONAL TIME SWITCH

■

Chime

This new chime is known as the "Beverly" Model No. 360. It is made of plastic with brass musical clef. It has four notes—front door signal; single note for side or rear doors. The Rhythm Master timer controls the note sequence. Timer has one moving part and this is submerged in oil within a hermetically-sealed steel cylinder. Chime is furnished with special transformer. Size is 16-in. by 6⅜-in. The A. E. Rittenhouse Company, Inc., Honeoye Falls, N. Y.



RITTENHOUSE CHIME

The "HUNT-and-PECK" System . . . . .



—may "get you by" in typing — but you'll wear out many an eraser in correcting errors.

No longer do keen-minded contractors risk the errors of a "hunt-and-peck" method of selecting electrical signaling systems. They know, as a part of their duty to protect valuable property and lives, that the dependable standards of Holtzer-Cabot signaling systems, approved by leading architects, municipal authorities, hospital and institutional officials and school executives, are proven assurance of trouble-free, life-long service.

Holtzer-Cabot leadership in the specialized field of dependable electrical signaling equipment constitutes recognized acknowledgment by American industry of our outstanding products and service.

The Holtzer-Cabot Electric Co.

125 AMORY STREET **BOSTON, MASS.**

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Under some conditions even good cord like TIREX will wear and it may be advisable to replace it. When the time comes to re-equip your portable tools and machines with portable cords or cables be sure the conductors have a copper area of suitable size for most efficient operation.

If your machines are now equipped with TIREX then you will have no difficulty in determining the size, type, number and stranding of the conductors and the voltage rating of the cord or cable.

All of this information is molded onto the selenium rubber sheath and is one of the distinguishing features of all stock sizes of Simplex-TIREX Cords and Cables.

SIMPLEX WIRE & CABLE COMPANY

79 Sidney Street, Cambridge, Massachusetts

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It's almost an endless job, gathering data for the Electrical Buyers Reference. But now comes the time when the editors are making final last-minute changes and the presses are ready to roll. It will take a couple of months to finish the staggering job of producing and distributing 30,000 of these huge volumes . . . But when the new '42 Edition comes along it will be worth waiting for.

This new edition will contain more catalog data than ever before. Leading manufacturers of electrical and allied equipment are now preparing "briefalogs" on their products, that give you the information you want, in a handy form, where you can get at it quickly.

Delivery date on this '42 edition will be announced as soon as possible. In the meantime, keep your current edition handy and use it often. It's the fastest, easiest, simplest way to obtain buying information.

HAVE WE OVERLOOKED YOU? *Every effort has been made to place E.B.R. in the hands of the key men—the men who specify and requisition—in the larger Utilities, Industrials, Wholesaling and Contracting Companies.*

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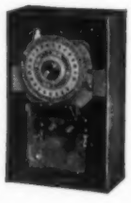
VALUABLE BUYERS' GUIDE



DEALERS-Sell
TORK CLOCKS

TURN ANYTHING ELECTRICAL ON AND OFF REGULARLY

Four Little Giant Models



Self-Starting

Ratchet Setting Dial; One Minute Accuracy; Hinged Cover; Lots of Room; 12 Knock-outs; 1 R.P.M. Indicator

191 A—Single Pole, 20 Amp. $13.00
1191 —Single Pole, 35 Amp. 14.00
962 A—Double Pole, 20 A. ea. 15.00
1962 —Double Pole, 35 A. ea. 16.00
Apt. House, 2-S.P. Circuits 25.00
Sixty Minute and Four Hour Timers

DEALERS PROFIT
Single 30%
2 or more.....35%

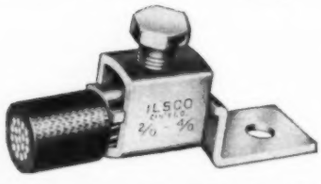
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MOUNT VERNON NEW YORK

ILSCO
SOLDERLESS CONNECTORS

HAVE YOU TRIED The New Ilsco Lugs?



BUILT FOR OVERLOADS!

The new design—as passed by the Underwriters' Laboratories May 1, 1940.

GENTLEMEN
Send me New Catalog and Sample

MAIL COUPON TODAY

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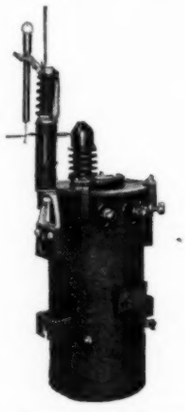
ILSCO COPPER TUBE AND PRODUCTS, INC.
5629 MADISON ROAD — CIN., O.

EQUIPMENT News

[FROM PAGE 163]

Transformer

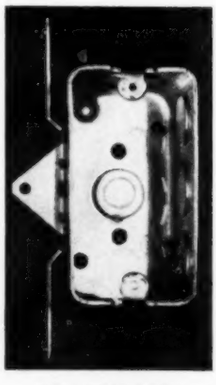
Type HEBF-EP rural line transformer is protected against all electrical hazards encountered in distribution service. It has protection against both surges and overloads. Some of the advantages claimed for this transformer are better performance, through integral protection of co-ordinated surge and overload protection; greater safety, and more economical both in installation and operation. Wagner Electric Corp., 6400 Plymouth Avenue, St. Louis, Mo.



WAGNER TRANSFORMER

Utility Box

This utility box with side bracket is for surface work in industrial locations and garages. The close, rigid bracket permits installation of boxes without protrusion beyond face of joist. Boxes can be nailed to side and front of studs. Bracket is attached to box with spacing to allow for average wallboard or plaster requirements. Top part of bracket is scored so it can be broken off when necessary. For flush installation, the boxes can be used with standard Textolite plates. General Electric Company, Bridgeport, Conn.



G-E UTILITY BOX

SEARCHLIGHT SECTION

(Classified Advertising)

Employment : : Equipment
Business : : (Used or Resale)
"OPPORTUNITIES"

UNDISPLAYED RATE

15 CENTS A WORD, MINIMUM CHARGE $3.00

Positions Wanted (full or part time salaried employment only), ½ the above rates payable in advance.

Box Numbers—Care of publication New York, Chicago or San Francisco offices count as 10 words.

Discount of 10% if full payment is made in advance for 4 consecutive insertions.

DISPLAYED RATE

Individual Spaces with border rules for prominent display of advertisements.

The advertising rate is $8.00 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.

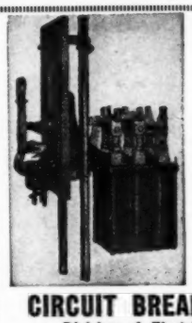
An advertising inch is measured ⅞" vertically on one column, 3 columns—30 inches—to a page.

BUSINESS OPPORTUNITY

Electrical Business

For Sale. Established 1919. No other contractor in town. Owner wishes to retire. Burton Electric, Brocton, N. Y.

USED EQUIPMENT FOR SALE



OIL SWITCHES
AIR CIRCUIT BREAKERS
TRANSFORMERS
COMPENSATORS
BOUGHT—SOLD

CIRCUIT BREAKER COMPANY
Division of Electric Equipment Co.
347 N. CLINTON AVE. ROCHESTER, N. Y.

ANOTHER OPPORTUNITY FOR ELECTRICAL DEALERS

You can buy completely overhauled and performance tested electric motors, generators, transformers, MG sets, welders, platers, etc., from Moreco and *Resell* at competitive prices and still make plenty profit. Send us your inquiries. We co-operate with dealers.

Here's a Bargain—Can you sell it?

100 KVA. Crocker-Wheeler, 3 phase, 60 cycle, 2300 volt, 257 RPM, size 1018-28 alternating current generator with direct connected exciter.

THE MOTOR REPAIR & MFG. CO.
1560 Hamilton Ave. Cleveland, Ohio

WANTED

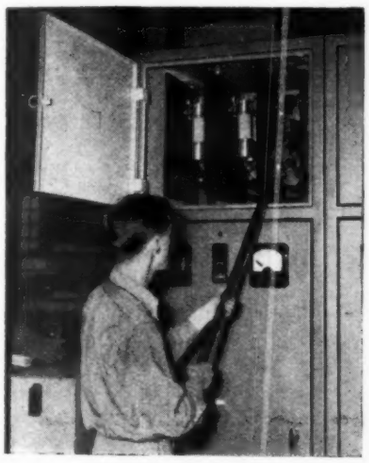
Wanted
Any quantity of
COPPER MAGNET WIRE

Double Cotton Covered, Square, Round, or Rectangular. Heavy Sizes Preferred—From No. 1 to 15. Must be New and in good shape. Send us Listings and Prices.

Phila. Transformer Co. 2829 CEDAR ST.
PHILADELPHIA, PA.

Starters

This new line of 2,300-volt, 60-cycle general purpose starters is designed for protection against short circuits and overloads. Four standard types are included providing for full-voltage starting, reduced voltage starting and reversing of squirrel-cage motors and synchronous motors. Starters for special applications are also available. Unit composed of oil-immerse contactor with self-cleaning copper tips, wide metal bearings and copper-braided shunts, EJ-2 current-limiting fuses, control and bus structure is metal-enclosed. Fuses have disconnect feature, making possible the isolation of an individual starter without causing entire motor line to be shut down. General Electric Company, Schenectady, N. Y.

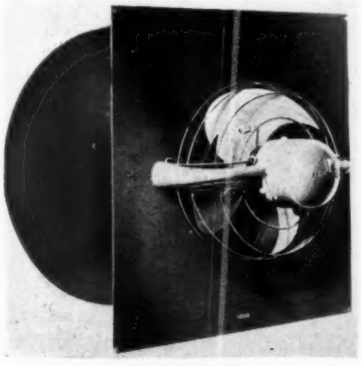


G-E STARTERS

■

Ventilator

This ventilator is for use in dark rooms in either home or small commercial studios. Ventilator changes air approximately every two minutes. Unit is composed of self-cooled motor propeller fan mounted in steel panel; a baffle or "hood" which prevents introduction of light without restricting air flow; and a fan guard. Ventilator can be operated on a light circuit. Ilg Electric Ventilating Co., 2850 N. Crawford Ave., Chicago, Ill.

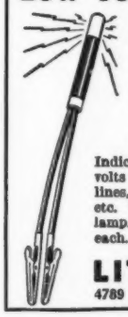


ILG VENTILATOR

WHERE TO BUY

Equipment, Materials and Supplies for Electrical Construction—Maintenance—Repairs

LOW VOLTAGE TATTELITE



Range 3 to 25 volts. Tests automotive currents on aeroplanes, autos, trucks, etc.; telephones, temperature controls, doorbell circuits, radio, continuity tests where low voltage is used. Pocket size, sturdy. Price $1.75 each.

NEON TATTELITE

Indicates voltages from 90 D.C. and 60 volts A.C. to 500 A.C. & D.C. Tests for live lines, polarity, blown fuses, grounded lines, etc. Will not "blow" like ordinary test lamp. Has 'phone tip prods. Price $1.00 each. Write for Littelfuse catalog.

LITTELFUSE, INC.
4789 N. Ravenswood Ave. Chicago, Ill.

TEST-O-LITE



Tests Everything Electrical From 100 to 550 Volts

Indispensable to electricians. Equipped with Neon light which tells instantly where trouble lies in electric circuits, fuses, cut-outs, motors, radios, electric appliances; indicates hot or grounded wires; tells A.C. from D.C.



Only TEST-O-LITE, original Neon tester, has exclusive patented safety features. Far superior to clumsy test bulb. Fountain pen size with pocket clip. Useful in homes also.

List $1.50 at leading jobbers.

L. S. BRACH MANUFACTURING CORPORATION
57 Dickerson St., Newark, N. J.

Electric Operators
For Any Overhead Type Door
DOORS AND OPERATORS INC.
See page 309 Elec. Buyers Ref. TIFFIN, OHIO

Low Cost! **ZENITH AUTOMATIC TRANSFER SWITCH** *Quick Delivery*

Electrically held, dependably accurate, at lowest cost. Used to furnish a continuous source of supply to lighting circuits in hospitals, theatres, buildings, etc. 18 sizes. 30 amps to 600 amps., A.C. or D.C. Type.



CATALOG. See complete line and low prices. Write today.

ZENITH ELECTRIC CO.
845 S. Wabash Ave. Chicago, Illinois

DRILLS CONCRETE—METAL—WOOD

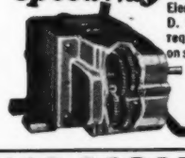


WODACK "DO-ALL" ELECTRIC HAMMER AND DRILL

Saves time and money installing expansion anchors. Drills concrete to 1⅜" dia.; metal to ⅜". Two tools in one. Easy to maintain. Universal motor. Write for folder.

Wodack Electric Tool Corporation
4628 W. Huron St. Chicago, Ill.
Telephone AUstin 9866

SpeedWay



Complete line of direct and back-geared "Flea Power" Electric Motors, A. C. and D. C.; any voltage. State requirement; 1 or a million on short notice. Catalog Free.

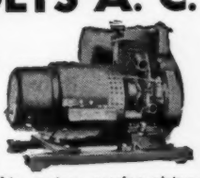
SPEEDWAY MFG. CO.
1866 S. 52nd Ave.
CICERO, ILL.

Over 87½% of the electric Hammers in use are Speedways because Speedways out-perform and outlast all others. Write for circular.



SPEEDWAY MFG. CO.
1866 S. 52nd Ave. CICERO, ILL. SpeedWay

110 VOLTS A. C. WITH Katolight Plants



Standard 60-cycle AC for sound truck equipment, AC radios, transmitters, flood lights, motors, moving picture projectors, etc.

A complete line of light and power plants ranging up to 15,000 watts capacity. Also 6, 12 and 32 volt battery charging plants. Diesel plants, rotary converters and frequency changers.

Write for latest catalog

KATO ENGINEERING CO.
6 Elm St. Mankato, Minn., U.S.A.

SIGNAL-LIGHT ON A STANDARD PLATE



Model # 170SW Unit, with a 2" lens for the message. Mounts on a single - gang box. Uses 3 or 6 watt S6-120V. Tungsten lamp.

The lamp is available from the front. Also available without switchplate for single hole panel mounting. (#170P). Underwriter's Approved.

Write for New Catalogue
Distributed Nationally by

THE GRAYBAR ELECTRIC CO., INC.
Mf'd by H. R. KIRKLAND CO., Morristown, N. J.

The **RATTAN** Man Says:
(Trade Mark Reg.)



"Many modern industrial fixture lighting circuits require No. 12 wire. You can make these connections with

The MARR No. 2

—the solderless connector that does the job cheaper and better than with tape, solder and torch."

A perfect joint connector
(Cap made of Bakelite)
—especially adapted for #12 WIRE





The MARR No. 2 gives you a solid, permanent connection, too. Simply insert the wires, tighten with a screw driver, turn on the Bakelite cap—and you're all set!

Approved by Underwriters

WRITE TODAY FOR FREE SAMPLES!
SEE YOUR ELECTRICAL DEALER.

THE RATTAN MANUFACTURING COMPANY
522 STATE STREET NEW HAVEN, CONN.
GENERAL SALES AGENTS: HATHEWAY AND CO.
75 Montgomery St., Jersey City, N. J., U.S.A.



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★ These companies have supplied additional buying information on their products in the 1941 edition of the Electrical Buyers' Reference.

We've Been Asking New Home Builders





ABOUT CIRCUIT BREAKERS

After contacting literally hundreds of new home builders, we have learned two facts which should be of real interest to electrical contractors.

Fact number one—in the homes without circuit breaker protection, the outstanding reason for not having it—the owners simply didn't know about Multibreakers.

Fact number two—in these same homes, virtually without exception, the owners said they would have preferred Multi-breakers, had they known about them.

The point is this—in spite of the substantial national advertising being devoted to circuit breakers, there are still a lot of people who don't know what they are, what they do and what they cost. Many have only a vague idea.

Alert electrical contractors who *suggest* and *explain* circuit breaker advantages to customers and prospective customers, will be ahead in two ways. They will strengthen their position against competition. They will build appreciation and confidence which leads to more jobs—and to *more profitable* jobs.



Sell the idea of circuit breakers. And recommend Square D Multi-breakers, confident that they will outlast any homes in which they are installed.

SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

KOLLSMAN INSTRUMENT DIVISION, ELMHURST, NEW YORK

IN CANADA: SQUARE D COMPANY CANADA LIMITED, TORONTO, ONTARIO

The Multi-breaker eliminates fuses completely—yet costs little if any more than the fusible equipment it replaces. When a short circuit or dangerous overload occurs, the circuit is cut off automatically. A simple movement of the circuit breaker lever restores current after the cause of the overload has been removed. No delay. Nothing to replace.



YOU WILL FIND ALL OF THE WIRING MATERIALS YOU NEED IN THE G-E LINE FOR INSTALLING MODERN LIGHTING

THE PROPER WIRING MATERIALS TO SERVE *Good Lighting*

G-E wiring materials are high quality and are designed to be used together. The line is complete. What is more, you can obtain them right in your own territory. G-E merchandise distributors are located at all key points in the country.

G-E CONDUIT PRODUCTS

G-E White rigid conduit is hot-dipped galvanized and will provide lasting protection for wiring systems. G-E Black rigid conduit is coated with a corrosion-resistant, elastic black enamel. Also available are G-E flexible conduit, E.M.T., Fiberduct underfloor raceway, BraidX and BX.

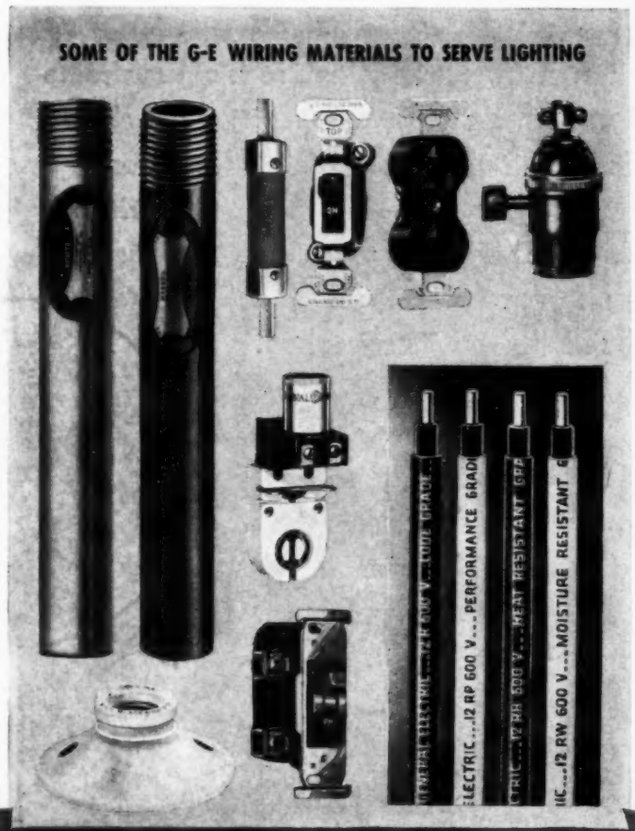
G-E WIRE AND CABLE

Four grades of G-E building wires are available—Type R, Code grade; Type RP, Performance grade; Type RH, Heat-resistant grade; Type RW, Moisture-resistant grade. G-E Type RW wire can be used in conduit in lieu of leaded cable where moisture is a problem. Flamenol Type SN small diameter wire is designed for rewiring raceways.

G-E WIRING DEVICES

Hundreds of different G-E wiring devices are available—sockets, Fluorescent lampholders and starters, receptacles, convenience outlets, switches, plates, fuses, branch circuit breakers, etc. Existing devices are improved constantly and new devices are added.

For further information about G-E wiring materials, see the nearest G-E Merchandise Distributor or write to Section CDW-180, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.



GENERAL ELECTRIC

